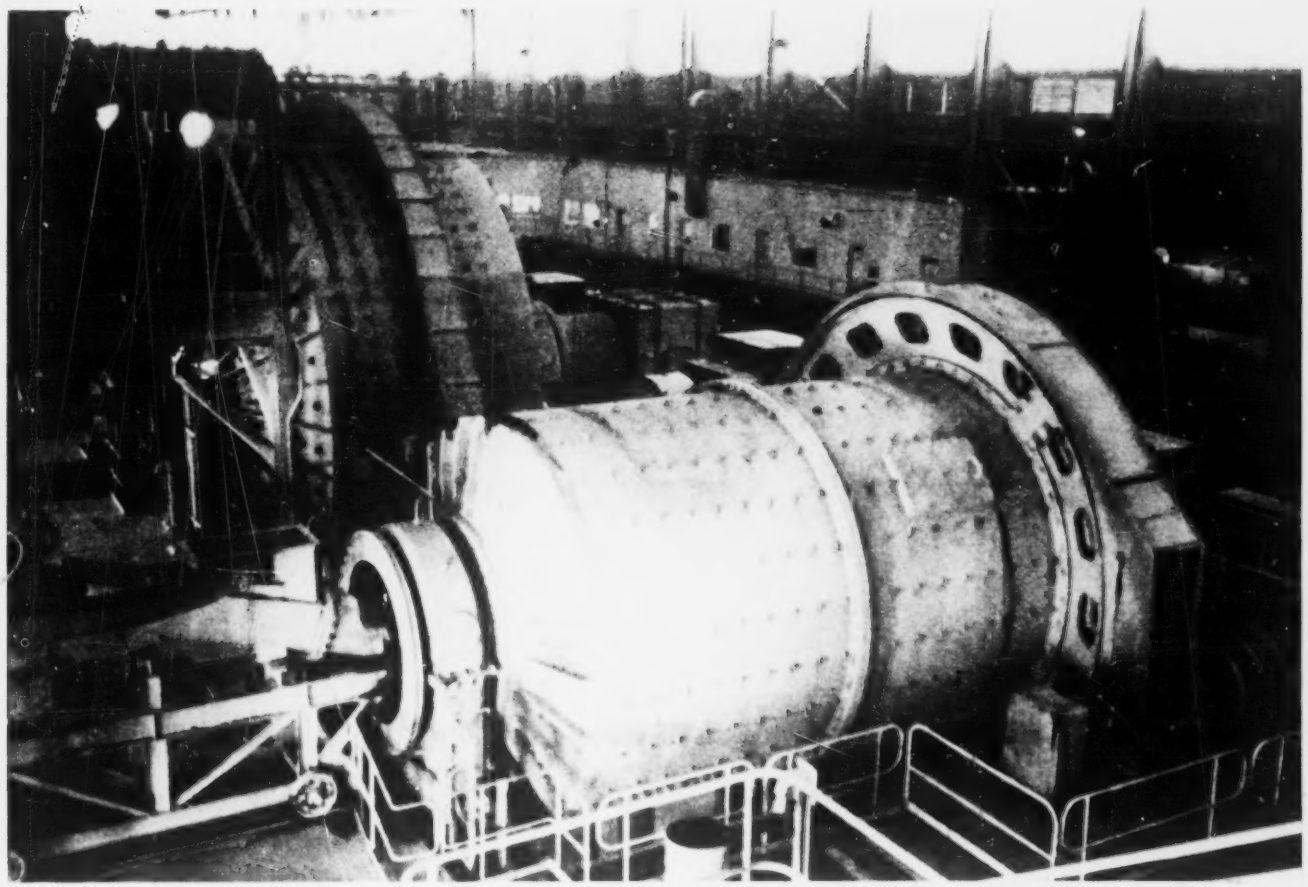
THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1987



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Phoenix, Arizona

Leroy E. Kissinger, Director

THE PRIMARY COPPER INDUSTRY OF ARIZONA

1987

Special Report Number 14

By

Richard R. Beard, Mining Engineer

February 1989

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(1 Throughout this report a "ton" means a short ton (2,000 pounds or 0.90718 metric ton).

Certain specific statistics may vary slightly from Table to Table. This is due to differences in their source.

INTRODUCTION

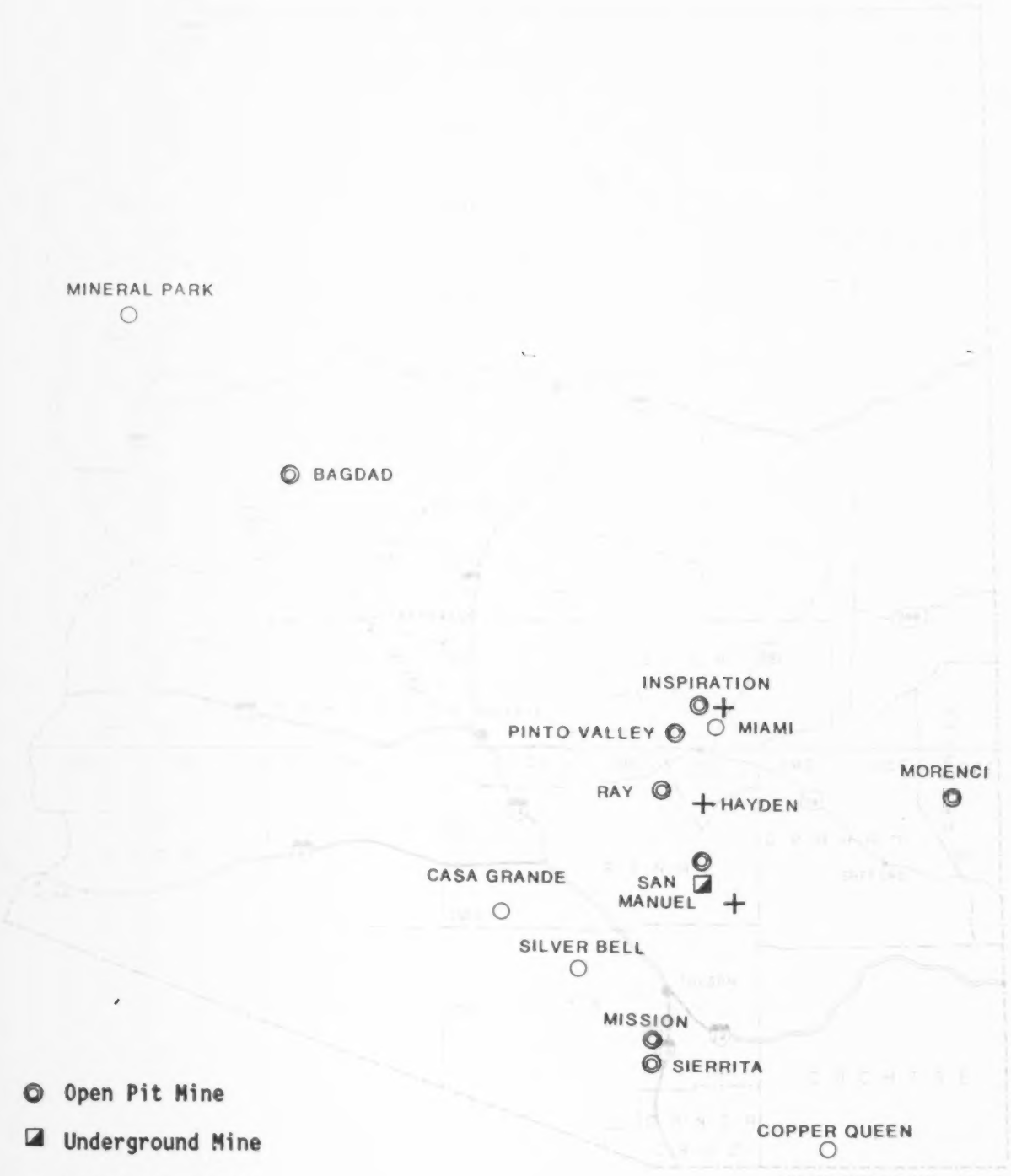
The Arizona Department of Mines and Mineral Resources presents herein a report covering activity in Arizona's copper industry in the calendar year 1987. A brief review of operational highlights reported by the major developers and producers in the State, market and price developments that affected copper production and discussions of Arizona severance taxes on metalliferous minerals are included.

The contained statistical tables include various production, employment, inventory, import/export, prices, costs and ore reserve numbers for 1987. Production of recoverable copper is given for individual mines and by company. Figures showing the importance of copper in the mining industry are provided, as are data on the by-products of copper mining; gold, silver and molybdenum. In addition, historical compilations are included for leach copper, average grade of ore produced, percent copper recovered, open pit mine stripping ratios, and employment and earnings. Additional compilations indicating refined copper inventories in and out of the United States and average copper prices by month from 1978 through 1987 are provided. Also included are tables showing designed mine capacity and copper reserves in Arizona plus average copper cash production costs for the United States, 1982-1986.

The Department maintains extensive reference libraries in its Phoenix and Tucson offices concerning the copper industry in Arizona. These repositories include information on individual mines and mining companies, United States Bureau of Mines and United States Geological Survey publications, other professional publications and periodicals and earlier editions of this report. Additionally, experienced mining engineers are available for consultation, at no charge, on matters germane to the minerals industry. Office hours are 8 a.m. to 5 p.m. on all non-holiday weekdays.

PRODUCING COPPER PROPERTIES

1987



COPPER PRODUCTION IN ARIZONA - 1987

Arizona's copper industry produced 862,034 tons of copper in 1987 (Table I). This is a decrease of 1.6% below 1986 and 19.6% below the record production of 1981 (Table IX). Arizona's share of the United States total was 61.4% (Table XXIV).

The gross value of non-fuel mineral production in Arizona in 1987 was up 13% over 1986 to $1,783,380,000 (preliminary) (Table X). Copper production represents 76% of this total and the by-products of copper production (gold, silver and molybdenum) represent an additional 5.4% (Table IX). The total contribution of the copper mines was therefore 82.3% of the gross value.

Copper was produced by 5 companies from 12 properties in 1987 and molybdenum was recovered as a co-product or by-product at 5 of these properties (Tables III & IV). Eight properties produced 98.6% of Arizona's copper and 3 produced 93.7% of the molybdenum. The Morenci-Metcalf mine of Phelps Dodge led in copper production with 30.8% of the total and the Sierrita-Esperanza complex produced 57.2% of the molybdenum.

More than 170,000 tons of copper representing 19.8% of the total was produced by leaching in 1987. Solvent extraction-electrowinning produced almost 135,000 tons of cathode copper from these leach solutions. The remaining 36,000 tons were precipitated as cement copper (Table I).

Stripping of waste, including some leachable material, was accomplished at the 8 operating open pit mines during 1987. The weighted average of the stripping ratios - waste to ore - was 1.21 to 1 (Table VIII). This is an increase from .96 to 1 in 1986 that probably indicates normal long range mine planning.

The weighted average grade - percent copper - of sulfide ores mined in 1987 was .58% copper (Table VI). This is lower than the average of the last 10 years and reflects the confidence of the copper industry.

The estimated capacity to produce copper at each of Arizona's principal operations totals 1.042 million tons annually (Table XI). By this estimate the mines, concentrators and leach facilities operated at 83% of capacity in 1987.

The copper reserve base in Arizona by company and property is estimated in Table XIII. The reserve base as defined in "Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3, includes those resources that are currently economic (reserves), marginally economic (marginal reserves) and some of those that are currently sub-economic (sub-economic reserves). The many technical, political, social and economic variables render a listing of actual economic reserves inappropriate.

1987 OPERATIONS SUMMARY

Operating Properties	12
Operating Companies	5
Operating Smelters	3
Ore Mined (Includes some oxide)	166,113,000 tons
Ore Milled (sulfide)	146,016,000 tons
Waste/Overburden Removed (includes some leach material)	182,460,000 tons
Average Stripping Ratio	1.21:1
Copper Produced	862,034 tons - 61.4% of U.S.
From Sulfide Ores	691,113 tons - 80.2% of AZ
Average Grade	.58% copper
From Leaching	170,921 tons - 19.8% of AZ
SX-EW	134,953 tons - 79.0% of Leached
Precipitation	35,968 tons - 31.0% of Leached
Molybdenum Produced	25,861,000 pounds
Silver Produced	3,217,000 troy ounces
Gold Produced	48,991 troy ounces
Average Employment	10,340
Average Annual Wage	$28,946
Productivity	120 pounds of copper per man-hour
	11.5 tons of ore per man-hour

STATUS AND PROGRESS

In 1987 the trends started in 1985 and pursued through 1986 continued. At the start of the year the price remained low and the only hope for survival appeared to be cost reduction. The continued decrease in stocks had little effect on the price until it became apparent that there was no excess production capacity that could be brought on line quickly. By the end of the year the price was well over a dollar a pound and seemed to be stabilizing. Although high prices were welcome they elicited no rush to develop any major new domestic properties because of the planned expansion of foreign production. Such projects as the Escondida porphyry in Chile which is expected to add over 300,000 tons of copper to the market in 1991, among others, keep the domestic producers conservative. Meanwhile 1988 appears destined to be a banner year.

No producing properties were shut down in 1987, nor were any developed or reactivated. Virtually all, however, were able to establish long term mining plans with some degree of confidence.

OPEN PIT MINING

The majority of the copper is produced by open pit mining methods. So far most of the improved efficiency has been the result of consolidation, preplanned maintenance, scheduling and utilization of equipment. The computer dispatching at Morenci is but one example of this. Now, however, major changes in operating methods are being considered.

At Morenci, Phelps Dodge has gone from an all rail haulage system to a system using trucks to service the shovels and haul to in-pit transfer points for rail haulage to the concentrators and distant dumps. With the purchase of the conveyor system from Anamax's closed Twin Buttes mine, rail haulage will be phased out completely.

Magma has brought its open pit mine for the oxide ore overlying the main sulfide orebody at San Manuel on line and it is now in production.

Cyprus has acquired Duval's properties and is increasing production at the Sierrita-Esperanza property to add to its continuing production at Bagdad.

Asarco purchased the Ray Mines Division from Kennecott to supplement its in-house production of concentrates to feed its Hayden Smelter.

UNDERGROUND MINING

At San Manuel, the only operating underground copper mine in Arizona, Magma is showing signs of optimism by continuing to invest in the development of the Kalamazoo ore body. Development of Asarco's underground ore body at Sacaton and Phelps Dodge's Safford property has been suspended indefinitely and no other underground development is under consideration in Arizona.

STATUS AND PROGRESS (CONT)

IN-SITU MINING

In-situ leaching of rubbleized copper bearing material remaining in mined out underground stopes has long been practiced in Arizona. At San Manuel, Magma is developing a more formalized program of leaching mined out block caving stopes and is approaching production status. During the last few years all of the production from the Lakeshore property has been from a similar system developed by Noranda. Cyprus is continuing this project as well as the tests initiated by Noranda into in-situ leaching of non-rubbleized or virgin ground. Kocide Chemical is also planning to produce copper from the Van Dyke property at Miami in this fashion, taking advantage of the test work conducted by Oxymin.

The U.S. Bureau of Mines is funding tests of in-situ leaching of virgin ground in Arizona. Science Applications International Corporation has been awarded a contract to identify analytical procedures and develop computer algorithms that could be used to select the best in-situ mining method for any specific copper oxide deposit. Cyprus is cooperating in this study at Cyprus Casa Grande (Lakeshore) and Asarco is cooperating at the Santa Cruz property near Casa Grande. The Santa Cruz ore body is a deep seated oxide deposit which is owned by Asarco and Freeport McMoran on a 50-50 basis.

CONCENTRATION

The overwhelming majority of copper mineralization in Arizona is of the sulfide type and is not amenable to leaching without extraordinary means. Inspiration has had success with its heap leach-ferric cure process on mixed oxide-sulfide ores and Kennecott pioneered the use of bacteria to convert sulfides to oxides in low grade dumps. However, as shown in Table I, about 80% of the copper was produced by the flotation method of concentration. In addition much of the leached copper produced is from dumps of "waste" which was stripped from open pit mines to provide access to sulfide ore. Another aspect of the flotation process that makes it viable at some properties is the recovery of molybdenum by selective flotation. Molybdenum provides a significant portion of the revenues from some properties. Also, any precious metals in the ore follow the copper through the flotation process and smelting to the electrolytic refinery where they can be recovered from the anode slimes.

There are currently 8 flotation concentrators in operation in Arizona. Asarco is operating 2 - Ray and Mission, Cyprus is operating 2 - Bagdad and Sierrita, Magma is operating 2 - San Manuel and Pinto Valley and Phelps Dodge is operating 2 at Morenci-Metcalf. Five are on standby. They are Asarco's at Silver Bell, Cyprus' at Mineral Park and Esperanza, Inspiration's at Miami and Phelps Dodge's at Ajo.

Although efficiency is constantly being improved, the flotation process is not cheap. It requires crushing and grinding the ore, separation of the ore minerals from the gangue minerals in the flotation cells, smelting the concentrate and refining the copper anodes from the smelter. The most significant development in flotation is the column flotation cell being installed in most concentrators.

STATUS AND PROGRESS (CONT)

SOLVENT EXTRACTION

Traditionally the copper produced from leach solutions has been extracted by the cementation process (precipitation from solution by the replacement of copper in solution by metallic iron). This has been a source of relatively cheap copper but the cement copper produced must be smelted and refined along with the flotation concentrates.

During the 60's Ranchers Exploration and Development Corporation pioneered the use of solvent extraction-electrowinning to produce copper from its Bluebird property near Miami. The obvious advantage of this method is that cathode copper of salable quality can be produced directly from leach solutions. Smelting, with its pollution problems, and further refining are therefore not required.

During the relatively good years experienced by the industry after Ranchers' introduction of solvent extraction-electrowinning, interest in the process grew gradually. The disastrous 80's have prompted an accelerated interest in it, however. Nine plants operated during 1987, one was moved from Cyprus Johnson to Cyprus Sierrita and the plant at Morenci came on line. Several expansions or new plants are planned and the cementation process is being phased out except as a subsidiary method.

SMELTING

Of the 6 smelters remaining in Arizona in 1987 only 3 operated. Asarco's Hayden smelter and Inspiration's smelter at Miami have been brought into compliance with air pollution constraints and Magma's smelter at San Manuel is being retrofitted with an OutoKumpu flash furnace to bring it into compliance. The Ray smelter at Hayden that Asarco acquired from Kennecott met all significant environmental constraints when last operated in 1982 and is available if needed. Phelps Dodge's smelters at Ajo and Morenci will require extensive retrofitting before they can be operated and their smelter at Douglas has been permanently shut down in lieu of retrofitting. Phelps Dodge is shipping concentrates to is Hidalgo smelter at Playas, New Mexico and to the Chino smelter at Hurley, New Mexico that was recently acquired from Kennecott. Excess concentrates are being sold.

As an alternative to smelting, Cyprus Casa Grande is planning to reactivate the Roast-Leach-Electrowinning (RLE) plant built by Hecla at the Lakeshore property. In this process flotation concentrates are roasted to make them acid soluble, leached with sulfuric acid and salable cathode copper is extracted from solution by electrowinning. Acid is produced from the roaster gases and the process is essentially pollution free. A portion of the concentrates from Sierrita will be processed at this plant.

PROGNOSTICATION

An advantage of publishing the 1987 report so late, for which I apologize, is that hindsight can be used to produce the 1988 "forecast". I will not take advantage of that but will instead try my luck at forecasting 1989.

STATUS AND PROGRESS (CONT)

Suffice it to say that 1988 brought broad smiles but furrowed brows to the industry. While the high prices of copper being experienced bring welcome relief, they also raise the spectre of "substitution". Once a market is lost to another commodity, it is very difficult to reclaim. However, with the predicted demand, the current worldwide production capacity and the expected expansion of that capacity over the next few years, the price of copper should remain at a level that is not conducive to substitution. Any upset in the world economy whether inflationary or recessionary will bring difficult times back to the industry, however.

ASARCO INCORPORATED

Corporate Headquarters - 180 Maiden Lane, New York, New York 10038 - Phone (212) 669-1000

Tucson Office - 1150 N. 7th Ave., P.O. Box 5747, Tucson, Arizona 85703 - Phone (602) 792-3010

The Tucson office houses the Southwest Mining Department, the Mining Department/Corporate Office, the Mineral Beneficiation Department, the Exploration Department, the Acid Sales Department and the Department of Safety and Technical Employment.

During 1987 Asarco's Arizona operation consisted of a major copper smelter at the Hayden Unit 2 major open pit mines at the Mission and Ray Units and a dump leaching/cementation operation at the Silver Bell Unit. Asarco now produces 60% of the feed to its smelters and with the increased production at the Mission complex it will be able to produce 67%.

Asarco and Freeport McMoran, its partner in the Santa Cruz deposit seven miles west of Casa Grande, will participate with the U.S. Bureau of Mines in an in-situ leaching experiment. This large deep seated deposit will be used to determine the feasibility of in-situ leaching of undisturbed virgin ground and to develop a data base for application to other suitable deposits. Hydrologic studies will be followed by the design and development of the leach field and the design of the pilot solvent extraction-electrowinning (SX-EW) plant.

Asarco also holds major reserves at the Chilito north of Hayden, at Helvetia, east of the Mission Complex and at Sacaton East.

In 1987 Asarco continued its corporate restructuring and cost reduction programs and has begun to realize the benefits. The consolidation and additional reserves at the Mission Complex, the modernization at Ray and the acquisition of the Helvetia reserves places the company in a strong competitive position.

Hayden Unit - Box 98, Hayden, Arizona 85235 - Phone (602) 356-7804

The Hayden Unit consists of an INCO flash furnace smelter rated at 940,000 tons of charge per year for an estimated production of 175,000 tons of blister copper. An acid plant rated at 2,800 tons of sulfuric acid per day keeps sulfur dioxide emissions within air quality restraints.

Although with the acquisition of Ray and the increased production at Mission, Asarco will provide about two thirds of its smelter feed, the company will still fill its traditional role as a custom and toll smelting company. The capacity at the Ray smelter is available if needed.

Mission Unit - Box 111, Sahuarita, Arizona 85629 - Phone (602) 791-2920

The Mission Unit consists of the consolidation of the Mission, Eisenhower, San Xavier, and Pima open pit mines into one large open pit

referred to as the Mission Complex. Also included is the smaller San Xavier North pit. The acquisition of the rest of the Eisenhower in April and of the Mineral Hill deposit adjacent to the Pima section of the open pit late in 1987 increased reserves and facilitates further efficiencies in pit design and mine planning.

Mining is conducted by electric shovels with truck haulage to the primary crusher and waste dumps. Some areas of the pit are back to final limits allowing some waste dumping in pit. The stripping ratio in 1987 was 1.05:1, waste to ore.

The concentrator capacity is being increased from 29,000 tons per day to 41,000 tons per day. This is being accomplished by lengthening the 10.5 foot diameter ball mills from 15 feet to 18 feet, installing 2 new ball mills salvaged from the Sacaton mill, converting some of the cleaner flotation cells to roughers and installing six 8x52 foot column flotation cells for cleaners.

Ray Unit - P.O. Box 9, Hayden, Arizona 85235 - Phone (602) 356-7811

The Ray Unit consists of an open pit mine, dump leach and heap leach operations and a SX-EW plant at Ray and a 26,000 ton per day concentrator at Hayden. The 400,000 ton per year smelter and 900 ton per day acid plant at Hayden are on stand-by status.

Mining is conducted by electric shovels supplemented by front-end loaders utilizing truck haulage. The production rate is 100,000 tons per day of which 26,000 tons are sulfide ore sent to the mill, 10,000 tons are silicate ore which is crushed and sent to the leach heaps and the remainder is low grade sent to leach dumps or waste sent to waste dumps. The mine plans are predicated on the sulfide operation and therefore silicate ore is stockpiled when in excess and fed from the stockpile to the crushers when short.

Sulfide ore is hauled to the primary crusher at Ray where it is crushed and transferred to trains for the 20 mile haul to the mill.

Silicate ore is hauled to the primary crusher then further reduced to minus 3/4 inch by secondary and tertiary crushers. It is then transported by conveyor where it is agglomerated with sulfuric acid while in transit to the heap leach area. Final haulage and placement on the heaps is by end-dump trucks.

Low grade muck is hauled to prepared leaching areas and non-mineral muck is hauled to waste dumps by end dump trucks. All leach solution are now fed to the SX-EW plant.

Previously stockpiled native copper ore is being reclaimed and fed to the mill in small proportions as is smelter slag.

New tailings dams are being built on the west side of the Gila River across from the present tailings dams.

ASARCO INCORPORATED (CONT)

Silver Bell Unit - Marana, Arizona 85653 - Phone (602) 622-6551

The Silver Bell Unit consists of an open pit copper mine and an 11,000 ton per day concentrator that are both on stand by status. The dump leaching operation and precipitation plant are in operation.

CYPRUS MINERALS COMPANY

Corporate Headquarters - 9100 E. Mineral Circle, P.O. Box 3299, Englewood, Colorado 80112 - Phone (303) 643-5000

Cyprus has continued to grow. In July of 1987 it added Noranda's Lakeshore property south of Casa Grande as Cyprus Casa Grande. In March 1988 they entered into a 15 year lease of the Twin Buttes property formerly operated by Anamax and in July 1988 they acquired the entire Inspiration property at Miami including the mines, concentrator (inactive), SX-EW plant, smelter, acid plant, electrolytic refinery and rod plant. Cyprus was the third largest producer of copper in 1987 and with the new acquisitions it should move into the second position. It will continue to be the largest producer of molybdenum.

In addition to its copper-molybdenum properties, Cyprus operates Arizona's largest gold mine, the Copperstone north of Quartzsite, and has entered into a joint venture agreement with Magma to explore the old Mammoth mine, which is a part of Magma's San Manuel property, as a possible gold operation. Cyprus would be the operating partner.

Cyprus Bagdad - P.O. Box 245, Bagdad, Arizona 86321 - Phone (602) 633-2241

The Bagdad operation consists of an open pit copper-molybdenum mine, a 54,000 ton per day concentrator, a dump leach operation and an SX-EW plant. Copper concentrates were shipped to Inspiration, Magma and Japan during 1987 and the SX-EW cathodes and molybdenum oxide are sent directly to market.

Mining is conducted by electric shovels using truck haulage to the primary crusher and dumps. The stripping ratio in 1987 was 0.77 to 1, waste to ore.

The sulfide ore is transported from the primary crusher at the mine, a distance of 6,400 feet to the coarse ore stockpile at the concentrator, by conveyor belts. There it is crushed further, ground by autogenous and ball mills and copper and molybdenum concentrates are produced. Column cells are utilized in the molybdenum flotation circuit.

Dual process ore (sulfide ore with an unusually high oxide content) is placed in heaps and leached for 60 days before being sent to the concentrator.

Pregnant solutions from the leach dumps are collected behind dams and pumped to the SX-EW plant at approximately 1.8 grams of copper per liter. The barren solutions are returned to the dumps after the copper has been extracted.

Cyprus Casa Grande - P.O. Box C-9, Casa Grande, Arizona 85222 - Phone (602) 623-1539

The Casa Grande operation consists of an in-situ leaching operation and an SX-EW plant. The block caved stopes in the oxide orebody are being leached and development of a leaching operation in virgin ground is underway using

high pressure pumps to inject sulfuric acid solution into holes drilled from the old underground workings. Pregnant solutions are collected in sumps underground and pumped to the SX-EW plant.

The roasters and acid plant of the Roast-Leach-Electrowinning (RLE) plant built by Hecla have been refurbished and should be in operation in 1988. Cyprus plans to treat concentrates from Sierrita at the plant. The pregnant solutions will go to the SX-EW plant and the acid produced from the roaster gases will be used for the leaching operations.

Cyprus Mineral Park - P.O. Box 6249, Kingman, Arizona 86401 - Phone (602) 565-2226

The Mineral Park property consists of an open pit copper-molybdenum mine and a 15,000 ton per day concentrator which are both on stand by status. The dump leaching operation and the precipitation plant are in operation and some in-pit leaching is also being conducted.

Cyprus Sierrita - P.O. Box 527, Green Valley, Arizona 85622 - Phone (602) 791-2950 & (602) 625-4800

The Cyprus Sierrita property consists of an open pit copper-molybdenum mine, a 100,000 ton per day concentrator, a ferromolybdenum plant, a rhenium plant, a dump leaching operation, precipitation plant and an SX-EW plant. The Esperanza pit and 17,500 ton per day concentrator were inactive during 1987 with the exception of the crushers that were used to supplement the Sierrita mill crushers.

Mining is conducted using electric shovels and truck haulage to the crushers and dumps. The stripping ratio in 1987 was 0.40:1, waste to ore. Dump leaching and precipitation began in the early 1960's.

When production ceased at Johnson Camp the SX-EW plant was moved to Sierrita to replace the precipitation plant. Lead anodes, titanium cathodes, extractants and other equipment and reagents were brought from Battle Mountain and Anamax to complete the installation and startup.

INSPIRATION RESOURCES CORPORATION

Corporate Headquarters - 250 Park Avenue, New York, New York 10197 - Phone (212) 503-3100

Inspiration Consolidated Copper Co. - P.O. Box 4444, Claypool, Arizona 85532 - Phone (602) 473-7006

The Inspiration properties consist of 3 open pit copper mines collectively called Inspiration Mines, a 24,000 ton per day concentrator which is currently on standby status, a 380,000 ton per year electric furnace smelter, acid plant, SX-EW plant, electrolytic refinery and a 135,000 ton per year rod plant.

The ore is mined at the rate of 93,000 tons per day with electric shovels and hauled by truck to high grade, low grade and waste dumps. The stripping ratio in 1987 was 2.04:1, waste to ore. Leach solutions from the low grade dumps are acidified and passed through the high grade dumps to produce a pregnant solution containing 5.6 grams per liter of copper to feed the SX-EW plant. The solvent extraction plant is being doubled in size from 4500 to 9000 gallons per minute to permit the use of lower grade solution without decreasing production.

Essentially all feed to the smelter is either purchased or tolled material. In 1987, 350,000 tons of concentrates and 67,000 tons of precipitates were treated. Custom anodes are cast to shapes required by customer.

The tank house has a combined capacity of 85,000 tons per year of elecrorefined and electrowon copper and is being expanded to 107,500 tons per year. Cathodes from both sections are fed to the continuous cast rod plant to produce 5/16" copper rod on reels holding three and one-third miles of rod each.

The Reymert mine west of Superior was operated for smelter flux and contributed 347,000 ounces of silver in 1987.

In July of 1988, Cyprus purchased all of Inspiration's copper properties, plants and equipment to operate under the name of Cyprus Miami.

MAGMA COPPER COMPANY

Corporate Headquarters - P.O. Box M, San Manuel, Arizona 85631 - Phone (602)385-3100

In March 1987 after nearly 20 years as a wholly owned subsidiary of Newmont Mining Corporation, Magma once again became an independent corporation. As such it has continued implementing an extensive expansion and modernization program to meet all environmental constraints and to become competitive in the copper market. As part of this program the company housing in the town of San Manuel is being sold.

Magma's operations are divided into the San Manuel Division and the Pinto Valley Division including the Pinto Valley Unit and the Miami Unit. The original Magma Mine at Superior was closed in 1982 and remains inactive.

Magma also operates a 29 mile railroad from San Manuel and a 28 mile railroad from Superior. Both connect to the Santa Fe Southern Pacific system.

San Manuel Division - P.O. Box M, San Manuel, Arizona 85631 - Phone (602) 385-3100

The San Manuel Division consists of a block-caving underground copper-molybdenum mine, a 62,000 ton per day concentrator, an open pit oxide copper mine, pad leach, in-situ leach, SX-EW plant, an 800,000 ton per year smelter with a 2000 ton per day acid plant and a 300,000 ton per year electrolytic refinery and a 150,000 ton per year rod plant.

After development of the grizzly and haulage levels, caving is initiated by undercutting the ore block. The caved ore is drawn through the grizzlies to the haulage level. Haulage to the production shafts is by 23 ton trolley locomotives pulling ten 15-17 ton ASEA cars or fifteen 12-13 ton rotary dump cars. After hoisting to the surface the ore is hauled by rail to the mill in 100 ton cars in groups of 35 to 40 pulled by 125 ton diesel-electric locomotives.

The 62,000 ton per day concentrator is being modernized by installing larger but fewer cyclones, by replacing controls with programmable controllers, by replacing small flotation cells with nine 2000 cubic foot Maxwell cells and seventy-two 300 cubic foot machines in the rougher circuit and by replacing conventional cells with column cells in the cleaner circuit.

At the smelter the reverberatory furnaces are being replaced with an Outokumpu Flask Smelting Furnace. At a design capacity of 3000 tons of concentrate per day, it will be the largest single furnace smelter in the industry. An oxygen plant and modifications to the acid plant are a part of the modernization.

Mining at the Open Pit Oxide Mine is accomplished with hydraulic excavators and front end loaders and truck haulage to the polyethylene lined leach dumps. Copper is recovered from the leach solutions at the SX-EW plant which uses the ISA process of plating the copper on stainless steel sheets rather than on copper starter sheets.

Cathodes from the electrolytic refinery and the SX-EW plant are melted and cast into continuous rods at the rod plant.

Pinto Valley Division - P.O. Box 100, Miami, Arizona 85631 - Phone (602) 425-7611

The Pinto Valley Division consists of the Pinto Valley Unit and the Miami Unit. At the Pinto Valley Unit mining is accomplished with electric shovels and truck haulage to the 60,000 ton per day concentrator. A dump leaching and a 6000 gpm SX-EW plant are also in operation. The concentrates and cathodes are shipped to San Manuel.

At Miami solutions from the in-situ leaching of the old Miami Copper block cave area are treated by SX-EW. The project to slurry and leach the old Miami Copper tailings is still under development.

PHELPS DODGE CORPORATION

Corporate Headquarters - 2600 North Central Avenue, Phoenix, Arizona 85004-3015 - Phone (602) 234-8100

Phelps Dodge is the nation's largest copper producer. In 1987 it accounted for one third of the nation's copper production at its mines in southeastern Arizona and southwestern New Mexico. In conjunction with its Arizona operations, Phelps Dodge operates the Hidalgo Smelter near Playas, New Mexico, a mine at Tyrone and the former Kennecott properties near Silver City, New Mexico in which it owns a two-thirds interest. These properties contributed 235,000 tons to Phelps Dodge's account.

The Chino Mines Branch consists of an open pit copper mine, a 37,500 ton per day concentrator, a dump leach precipitation plant and a 500,000 ton per year INCO Flash smelter with an acid plant. A 35,000 ton per year solvent extraction-electrowinning plant is planned. The mine and concentrator are located at Santa Rita about 15 miles east of Silver City and the smelter is located about 9 miles south of the mine at Hurley.

At Tyrone, about 10 miles south of Silver City, Phelps Dodge operates an open pit copper mine and concentrator which produced 123,900 tons of copper in concentrates and precipitates in 1986. The solvent extraction-electrowinning plant rated at 35,000 tons per year produced an additional 35,400 tons of copper in 1986. Expansion of the plant is in progress and further expansion is under consideration.

The Hidalgo smelter near Playas, New Mexico is an OutoKumpo flash furnace rated at 500,000 tons per year. During 1986 the oxygen enrichment plant from the Morenci smelter was installed to increase capacity and efficiency. The resulting increase in sulfur dioxide concentration of the gases improved the operation of the acid plant as well.

The development of an underground mine at the Dos Pobres property near Safford, Arizona was suspended in 1982 and allowed to flood in August 1984 and remains inactive. In 1986 Phelps Dodge acquired the nearby Lone Star property from Kennecott.

At Copper Basin near Prescott, Phelps Dodge has continued to pursue a land trade with the Forest Service. There are no current plans to develop the property, however.

Morenci Branch - Morenci, Arizona 85540 - Phone (602) 865-4521

The Morenci Branch consists of the combined Morenci-Metcalf open pit copper mine, the 60,000 ton per day Morenci concentrator with a molybdenum circuit, the 40,000 ton per day Metcalf concentrator and a dump leach - SX-EW operation. The 650,000 ton per year smelter with a 2400 ton per day acid plant remain inactive and will require extensive modifications to meet air quality restraints if ever reactivated. Somitomo Mining Arizona, Inc. holds an undivided 15% interest in the Morenci branch excluding the inactive smelter.

Mining is conducted with electric shovels and truck haulage utilizing a computer controlled Modular Mining Truck Dispatching System for maximum efficiency. These will feed the In Pit Crushing and Conveying system (IPCC) which will deliver the crushed ore to a stockpile which will feed both concentrators by conveyor belts. Both concentrators are standard flotation mills except that column flotation cells have been installed in the cleaner circuit of each.

All mined material other than ore is classified as leach material and is taken to one of several leach dumps. There are 3 widely spaced solvent extraction plants to upgrade the solutions before they are pumped to the centrally located tank house for electrowinning. The total capacity of the SX-EW system is 30,000 gallons per minute of pregnant leach solution.

Copper Queen Branch - Highway 92, Bisbee, Arizona 85603 - Phone (602) 432-3621

The Copper Queen facility consists of a dump leaching and precipitation operation at the mined out Lavender pit.

A drilling program on an area north of the Lavender pit was conducted in 1987 to define a possible ore body amenable to treatment by heap leaching and SX-EW. The results of a feasibility study are not yet available.

New Cornelia Branch - Ajo, Arizona 85321 - Phone (602) 387-7451

The New Cornelia Branch consists of an open pit copper mine, a 30,000 ton per day concentrator with a molybdenum circuit and a 190,000 ton per year smelter with an acid plant. The mine has been inactive since August 1984 and the smelter was shut down in April 1985. There are no immediate plans to reactivate the operation.

SEVERANCE TAX ON METALLIFEROUS MINERALS

Background

Laws of 1982, Chapter 230, repealed the tax on sales of metalliferous minerals and enacted a severance tax in its place. Under the provisions of the severance tax, metalliferous minerals were to be taxed at the time of production, not at the time of sale. All metalliferous minerals produced after 1982 were to be taxed on the greater of the following 2 values:

1. The "weighted mineral value" which is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed, or

2. A specified percentage of the old sales tax base.

The severance tax was to be levied on metalliferous minerals at a rate of 2 1/2 percent. Unless otherwise provided by law, the tax was to be administered in the same manner as the sales tax. As a result, severance tax payments were due on the first day of the second month following the month in which the tax accrued. From January 1, 1983 through June 30, 1983, 40 percent of the severance tax was to be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). In subsequent fiscal years, a progressively larger share of the severance tax was to be distributed in the same manner as the transaction privilege tax. The balance of severance tax collections, after making this distribution, was to be deposited each year in the state's general fund. (Effective from and after December 31, 1982.)

Laws of 1983, Chapter 4 changed the due date for payment of the Severance Tax to the twentieth day of the month following the month in which the tax accrues. Taxes were to be delinquent if not received by the Department of Revenue on the day preceding the last day of the month in which they were due. (Effective April 1, 1983). The law also changed the interest rate on delinquent tax payments to equal the rate established by Section 6621 of the Internal Revenue Code, compounded annually. (Effective February 11, 1983.)

Legal Citation

A.R.S. 42-1461 - 42-1466.

Paid by

Persons engaged in the business of extracting substances from the earth that become metalliferous minerals (A.R.S. 42-1461 - 42-1462.)

Exemptions

None.

SEVERANCE TAX ON METALLIFEROUS MINERALS (CONT)

Tax Base

The severance tax is levied on the "net severance base" of all metalliferous minerals produced after 1982 (42-1462). The "net severance base" is the greater of the following 2 values (42-1464, Laws of 1982, Chapter 230, Section 12):

1. The "weighted mineral value", or

2. A specified percentage of the old sales tax base (the gross value of production less out-of-state processing costs). This value will be referred to as the "Arizona value" after June 30, 1985.

The "weighted mineral value" is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed.

The "weighted mineral value" is determined using the following formula (42-1464):

$$\text{weighted mineral value} = \frac{\text{mining costs}}{\text{total production costs}} \times \text{gross value of production}$$

where:

mining costs represent the cost of extracting the minerals from the earth and delivering them to the site where they will be processed further (42-1461).

total production costs include most of the major costs incurred in mining and processing minerals until the point of sale (42-1461).

gross value of production is determined by multiplying the recoverable units of a metallic product by the per unit price of the product; the price per unit does not include the cost of manufacturing, fabricating or otherwise transforming a refined mineral product, when these activities occur prior to sale of the product (42-1461).

Although metalliferous minerals will no longer be taxed on the old sales tax base, the value of minerals produced after 1982 may not fall below a specified percentage of the old tax value (42-1464, Laws of 1982, Chapter 230, Section 12). The old tax value included not only the cost of extracting the minerals from the earth, but most of the major in-state costs of producing the minerals. This value was determined by multiplying the recoverable units of a metallic product by the per unit price and deducting the out-of-state processing costs from the result (42-1464; Laws of 1982, Chapter 230, Section 12; 41-1461). The following table shows the minimum percentage of the old tax value that may be assigned to minerals for severance tax purposes (42-1464; Laws of 1982, Chapter 230, Section 12):

Period during which minerals are produced	Minimum value of minerals for purposes of determining the severance tax
January 1, 1983 - June 30, 1983	100% of the old taxable sale value
July 1, 1983 - June 30, 1984	83-1/3% of the old taxable sale value
July 1, 1984 - June 30, 1985	66-2/3% of the old taxable sale value
July 1, 1985 and thereafter	50% of the old taxable sale value

Tax Rate

During fiscal years 1980-81, 1981-82 and 1982-83, businesses that produced mineral products were permitted to claim a tax credit against the Special Excise Tax for Education. The tax credit was determined by formula (see "TAX CREDIT" under "SPECIAL EXCISE TAX FOR EDUCATION"). The tax credit could not exceed the taxpayer's Special Excise Tax liability for the year. However, if a taxpayer had an unused amount of credit for any year in which his production was curtailed due to economic conditions, the unused credit could be carried forward for a period not to exceed three years. Since the Special Excise Tax does not apply to metalliferous minerals after December 31, 1982, businesses that produce metalliferous minerals are authorized to claim this tax credit against their severance tax liability, beginning in 1983. In 1982-83, the amount of credit claimed may not exceed 40 percent of the taxpayer's severance tax liability (Laws of 1982, Chapter 228, Section 2; Laws of 1982, Chapter 230, Section 15).

Due Date

Collections from the severance tax on metalliferous minerals are due on the twentieth day of the month following the month in which the tax accrues. Taxes are delinquent if they are not received by the Department of Revenue on the day preceding the last day of the month in which they are due. The due date may be extended by the Department of Revenue for good cause, but not beyond the first day of the third month following the regular due date (42-1465, 42-1322).

Collecting Agency

Department of Revenue. (42-1462, 42-101)

Dedication or Purpose

To aid in defraying the necessary and ordinary expenses of the state, cities, and counties to reduce or eliminate the annual tax levy on property for state, city and county purposes and to reduce the levy on property for public school education (Laws of 1982, Chapter 230, Section 17).

Yield

No monies will be collected from this tax until fiscal year 1982-83.

Distribution

Each year, a portion of severance tax collections will be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). The portion of collections that is distributed in this manner will increase each fiscal year until 1986-87. The table below shows the amount of severance tax collections that will be distributed in the same manner as transaction privilege taxes during each fiscal year (42-1465, Laws of 1982, Chapter 230, Section 16).

period during which collections are received	portion of severance tax collections distributed in the same manner as the transaction privilege tax
January 1, 1983 - June 30, 1983	40%
July 1, 1983 - June 30, 1984	48%
July 1, 1984 - June 30, 1985	60%
July 1, 1985 and thereafter	80%

After making this distribution the balance of severance tax collections will be deposited each year in the state's general fund and is appropriated for public educational purposes (42-1465; Laws of 1982, Chapter 230, Section 16).

Source: State of Arizona Tax Handbook - 1983
Prepared by the Staff of the Joint Legislative Budget Committee

TABLE I

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1987

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
ASARCO, INC.					
Mission Complex	9,926,000	9,926,000	117,195,000		10,379,000
Ray Unit	11,970,000	9,709,000	144,803,000		23,768,000
Dump Leach/Cementation			5,156,000		
Dump Leach/SX-EW			14,053,000		
Heap Leach/SX-EW			49,334,000		
Silver Bell					
Dump Leach/Cementation			12,800,000		
Total	21,896,000	19,635,000	343,341,000		34,147,000
CYPRUS MINERALS CO.					
Bagdad	21,100,000	21,100,000	165,632,000	6,087,000	17,000,000
Dump Leach/SX-EW			16,470,000		
Casa Grande In Situ/SX-EW *(1*			4,145,000		
Mineral Park Dump Leach/Cementation			4,405,000		
Sierrita/Esperanza	27,600,000	27,600,000	150,000,000	14,800,000	11,160,000
Dump Leach/Cementation			2,513,000		
Dump Leach/SX-EW			5,430,000		
Total	48,700,000	48,700,000	348,595,000	20,887,000	28,160,000

(1 Includes Noranda's 1987 production prior to 6/31/87.

(continued)

TABLE I (CONT)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1987

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
INSPIRATION CONSOLIDATED					
Heap Leach	10,856,000				22,199,000
SX-EW			92,118,000		
Cementation			13,437,000		
Total	10,856,000		105,555,000		22,199,000
MAGMA COPPER CO.					
San Manuel Division					
Sulphide	16,026,000	16,071,000	190,900,000	3,353,000	Block Caving
Oxide	7,439,000				25,752,000
Heap Leach/SX-EW			49,870,000		
In Situ/SX-EW			1,408,000		
Pinto Valley Division	21,452,000	21,763,000	128,376,000	800,000	28,330,000
Dump Leach/SX-EW			13,340,000		
In Situ/SX-EW			9,384,000		
Total	44,917,000	37,834,000	393,278,000	4,153,000	54,082,000

(continued)

TABLE I (CONT)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1987

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
PHELPS DODGE CORP.					
Copper Queen Branch					
Dump Leach/Cementation			2,730,000		
Morenci/Metcalf *(1*	39,744,000	39,847,000	485,320,000	821,000	43,872,000
Dump Leach/Cementation			30,895,000		
Dump Leach/SX-EW			14,354,000		
Total	39,744,000	39,847,000	533,299,000	821,000	43,872,000
(1 Includes Sumitomo's 15%.					
Totals					
Sulphide	147,818,000	146,016,000	1,382,226,000	25,861,000	134,509,000
Oxide (Leach)	18,295,000				
Dump Leach/Cementation			71,936,000		
Dump Leach/SX-EW			63,647,000		
Heap Leach/SX-EW			191,322,000		
In Situ/SX-EW			14,937,000		
Sub Total SX-EW			269,906,000		
Sub Total Leached			341,842,000		
GRAND TOTAL	166,113,000	146,016,000	1,724,068,000	25,861,000	182,460,000

Source: Personal correspondence with individual companies.

TABLE II

ARIZONA LEACH COPPER PRODUCTION *(1*

(Thousand Pounds)

MINE OPERATION	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
ANAMAX MINING COMPANY										
Twin Buttes	71,614	70,343	63,719	67,922	60,796	50,649	50,239	19,824	--	--
ASARCO INCORPORATED										
San Xavier	15,183	--	--	--	--	--	--	--	--	--
Silver Bell	6,267	6,980	4,423	7,950	8,687	10,374	9,152	8,800	6,814	12,800
Ray *(2*	25,013	26,502	25,875	25,788	22,420	20,033	20,457	23,706	56,639	68,543
CYPRUS MINES CORP.										
Bagdad	14,097	14,337	12,668	13,244	13,173	13,282	14	14,259	13,958	16,470
Casa Grande *(3*	--	--	--	26,071	45,611	3,244	15,401	13,514	7,100	4,145
Johnson	10,205	10,032	10,302	10,693	9,702	--	8,803	6,200	--	--
Sierrita/Esperanza *(4*	7,469	6,002	9,991	11,566	9,354	6,367	8,500	10,000	8,770	7,943
Mineral Park *(4*	4,813	3,348	3,690	4,194	3,191	3,101	2,718	3,798	4,251	4,405
INSPIRATION CONSOLIDATED COPPER COMPANY										
Inspriation	35,945	16,638	28,958	50,532	50,000	78,988	79,549	85,136	98,747	105,555
Ox Hide	4,147	1,178	1,015	761	1,572	--	--	--	--	--
MAGMA COPPER CO.										
Copper Cities	3,806	4,351	3,984	3,622	2,046	--	--	--	--	--
Pinto Valley/Miami	11,703	12,636	11,184	15,736	26,958	24,632	25,602	23,947	22,252	22,724
San Manuel *(5*	--	--	--	--	--	--	--	--	21,923	51,278
PHELPS DODGE CORPORATION										
Copper Queen Branch	7,932	7,316	6,052	4,600	4,545	5,200	3,493	4,144	3,454	2,730
Morenci Branch	51,362	93,983	86,840	96,090	75,735	69,158	60,312	53,228	56,261	45,249
New Cornelia Branch	--	--	--	--	661	--	920	402	--	--

(continued)

TABLE II (CONT)

ARIZONA LEACH COPPER PRODUCTION (1

(Thousand Pounds)

MINE OPERATION	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now HECLA MINING CO.)										
Bluebird (6	3,926	10,955	13,017	13,328	NR	--	--	--	--	--
Old Reliable	--	1,005	1,128	149	--	--	--	--	--	--
TOTALS	283,482	285,606	282,846	352,246	334,451	285,028	285,160	266,958	300,169	341,842
PERCENT OF PRIMARY COPPER PRODUCED (7	13.9	13.3	16.4	15.0	19.6	18.8	18.0	15.0	17.1	19.8

(1 Copper recovered by precipitation or by solvent extraction from material dump, heap, vat or in situ leached.
(2 Asarco purchased Ray Unit from Kennecott November 18, 1986.
(3 Hecla Lakeshore through 3/31/79; Noranda Lakeshore through 6/31/87; Now Cyprus Casa Grande.
(4 Cyprus purchased Sierrita/Esperanza and Mineral Park from Duval April 1, 1986.
(5 Open Pit, Heap Leach, SX-EW start-up in spring of 1986. Some In Situ test production.
(6 Part of Inspiration since July, 1984.
(7 Leach Copper compared to total copper produced as reported in this report, Table I.

Source: Arizona Department of Mines and Mineral Resources; This report, Table I-II

TABLE III

RANK OF ARIZONA'S COPPER COMPANIES

BY PRODUCTION OF COPPER AND MOLYBDENUM

1987

Copper			Molybdenum		
Rank	Company	% of AZ Production	Rank	Company	% of AZ Production
1	Phelps Dodge Corp. 533,299,000	31.0	1	Cyprus Minerals Co. 20,887,000	80.8
2	Magma Copper Co. 393,278,000	22.8	2	Magma Copper Co. 4,153,000	16.0
3	Cyprus Minerals Co. 348,595,000	20.2	3	Phelps Dodge Corp. 821,000	3.2
4	Asarco Inc. 343,341,000	19.9			
5	Inspiration Cons. 105,555,000	6.1			
Total	1,724,068,000	100.00		25,861,000	100.00

TABLE IV

RANK OF ARIZONA'S COPPER MINES

BY PRODUCTION OF COPPER AND MOLYBDENUM

1987

Copper			Molybdenum		
Rank	Mine/Company Copper Produced, lb.	% of AZ Production	Rank	Mine/Company Moly Produced, lb.	% of AZ Production
1	Morenci/Phelps Dodge 530,569,000	30.8	1	Sierrita/Cyprus 14,800,000	57.2
2	San Manuel/Magma 242,178,000	14.0	2	Bagdad/Cyprus 6,087,000	23.5
3	Ray/Asarco 213,346,000	12.4	3	San Manuel/Magma 3,353,000	13.0
4	Bagdad/Cyprus 182,102,000	10.5	4	Morenci/Phelps Dodge 821,000	3.2
5	Sierrita/Cyprus 157,943,000	9.2	5	Pinto Valley/Magma 800,000	3.1
6	Pinto Valley/Magma 151,064,000	8.8			
7	Mission/Asarco 117,195,000	6.8			
8	Inspiration/Inspiration 105,555,000	6.1			
9	Silver Bell/Asarco 12,800,000	0.74			
10	Mineral Park/Cyprus 4,405,000	0.26			
11	Casa Grande/Cyprus 4,145,000	0.24			
12	Copper Queen/Phelps Dodge 2,730,000	0.16			
Total	1,724,068,000	100.00		25,861,000	100.00

TABLE V
ARIZONA MINE PRODUCTION
OF RECOVERABLE COPPER IN SHORT TONS

	1983		1984		1985		1986		1987	
	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE
					BY MONTH					
JANUARY	68,560	(19.0)%	68,096	0.4%	72,508	6.5%	78,138	7.8%	71,375	(8.7)%
FEBRUARY	54,455	(30.1)	62,432	9.8	67,823	8.6	67,524	(0.4)	65,046	(3.7)
MARCH	66,475	(26.5)	66,058	0.4	76,717	16.1	72,834	(5.1)	72,226	(0.8)
APRIL	61,841	(29.2)	61,076	(0.2)	75,928	24.3	70,306	(7.4)	67,221	(4.4)
MAY	63,699	(13.3)	66,125	4.9	76,690	16.0	73,446	(4.2)	69,413	(5.5)
JUNE	65,449	(2.6)	71,133	9.8	70,816	(0.4)	72,747	2.7	68,560	(5.8)
JULY	54,653	(10.1)	70,235	29.9	72,534	3.3	74,009	2.0	67,631	(8.6)
AUGUST	52,118	(8.2)	70,019	35.8	74,134	5.9	71,488	(3.6)	69,157	(3.3)
SEPTEMBER	64,852	15.9	69,528	8.3	70,732	1.7	72,402	2.4	69,057	(4.6)
OCTOBER	64,049	4.0	73,316	15.8	74,081	1.0	76,159	2.8	71,062	(6.7)
NOVEMBER	69,886	2.8	73,541	6.3	73,129	(0.6)	70,220	(3.6)	74,985	6.8
DECEMBER	65,366	8.4	68,901	4.8	78,987	14.6	70,635	(10.6)	76,587	8.4
					CUMULATIVE YEAR TO DATE					
JANUARY	68,560	(19.0)%	68,096	0.4%	72,508	6.5%	78,138	7.8%	71,375	(8.7)%
FEBRUARY	126,015	(24.5)	130,528	4.7	140,331	7.5	145,662	3.8	136,421	(6.3)
MARCH	192,490	(25.2)	196,586	3.2	217,048	10.4	218,496	0.7	208,647	(4.5)
APRIL	254,331	(26.2)	257,662	2.4	292,976	13.7	288,802	(1.4)	275,868	(4.5)
MAY	318,030	(23.9)	323,787	2.9	369,666	14.2	362,248	(2.0)	345,281	(4.7)
JUNE	383,479	(21.0)	394,920	4.1	440,482	11.5	434,995	(1.2)	413,841	(4.9)
JULY	438,132	(19.8)	465,155	7.3	513,016	10.3	509,004	(0.8)	481,472	(5.4)
AUGUST	490,250	(18.7)	535,174	10.3	587,150	9.7	580,492	(1.1)	550,629	(5.1)
SEPTEMBER	555,102	(15.7)	604,702	10.1	657,882	8.8	652,894	(0.8)	619,686	(5.1)
OCTOBER	619,151	(14.1)	678,018	10.7	731,963	8.0	729,053	(0.4)	690,748	(5.3)
NOVEMBER	689,037	(12.6)	751,559	10.2	805,092	7.1	799,273	(0.7)	765,733	(4.2)
DECEMBER	754,403	(11.1)	820,460	9.7	884,079	7.7	869,908	(1.6)	842,320	(3.2)
AVERAGE MONTH	**62,867**	**(11.1)%**	**68,372**	**9.7%**	**73,673**	**7.7%**	**72,492**	**(1.6)**	**70,193**	**3.2**

NOTE: Percentage change column shows change from corresponding period in prior year. Parentheses indicate a negative change.

Source: U.S. Department of the Interior, Bureau of Mines
Prepared By: State of Arizona Joint Legislative Budget Committee

TABLE VI

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
ANAMAX MINING COMPANY											
Twin Buttes *(1*	Sulfide	1.26	0.94	0.82	0.74	0.78	0.67	--	--	--	--
	Oxide	1.26	1.27	1.26	1.20	1.06	0.93	0.86	0.84	--	--
ASARCO INCORPORATED											
Mission *(2*	Sulfide	0.59	0.60	0.75	0.75	(0.75)	(0.75)	(0.75)	0.65	0.70	0.67
Pima *(2*	Sulfide	--	0.46	0.49	0.49	0.48	--	--	--	--	--
Ray Unit *(3 (4*	Sulfide	0.86	0.88	0.91	0.97	0.80	1.19	1.13	0.99	0.99	0.89
	Oxide (Silicate)	--	--	--	--	--	--	--	1.17	1.23	1.15
Sacaton	Sulfide	0.67	0.68	--	--	--	--	--	--	--	--
San Xavier *(2*	Sulfide	--	0.80	0.65	0.65	(0.65)	(0.51)	(0.51)	--	--	--
Silver Bell	Sulfide	0.65	--	--	--	--	--	--	--	--	--
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	0.52	0.50	0.50	0.50	0.50	0.50	0.45	0.44	0.45	0.48
Esperanza *(5*	Sulfide	--	--	0.32	0.29	0.29	--	--	--	--	--
Johnson	Oxide	0.44	0.40	0.40	0.40	0.40	0.40	0.71	--	--	--
Mineral Park *(5*	Sulfide	0.26	0.24	0.24	0.32	--	--	--	--	--	--
Sierrita *(5*	Sulfide	0.33	0.34	0.34	0.30	0.30	(0.30)	0.34	0.33	0.34	0.33
INSPIRATION CONSOLIDATED COPPER CO.											
Christmas (OP)	Sulfide	--	0.74	0.73	0.62	--	--	--	--	--	--
Inspiration Area	Sulfide	0.61	0.85	0.58	0.58	0.58	0.53	0.55	0.60	0.54	--
	Oxide	--	--	--	--	--	--	0.50	0.49	0.57	0.59

(continued)

TABLE VI (CONT)

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	0.52	0.49	0.49	0.46	0.46	--	0.44	0.45	0.45	0.36
San Manuel	Sulfide	0.64	0.63	0.65	0.64	0.66	0.64	0.64	0.61	0.62	0.62
	Oxide	--	--	--	--	--	--	--	--	0.58	0.64
Superior	Sulfide	4.36	4.41	4.32	4.48	4.32	--	--	--	--	--
NORANDA LAKESHORE MINES INC.											
Lakeshore	Oxide	--	--	--	1.00	1.00	(1.00)	(1.00)	--	--	--
PHELPS DODGE CORPORATION											
Metcalf	Sulfide	0.79	0.78	0.69	--	0.78	--	--	--	--	--
Morenci *(6*	Sulfide	0.80	0.71	0.82	0.74	0.72	0.73	0.81	0.86	0.84	0.82
New Cornelia	Sulfide	0.59	0.53	0.51	0.50	0.64	0.60	0.55	--	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now HECLA MINING CO.)											
Bluebird *(7*	Oxide	0.70	0.40	0.40	0.40	--	--	--	--	--	--
WEIGHTED AVERAGE SULFIDE GRADE *(8*		0.61	0.64	0.58	0.58	0.59	0.65	0.70	0.62	0.61	0.58

(continued)

TABLE VI (CONT)

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

( ) Percentage in parenthesis is approximate: not used in calculation of weighted average.

(1 Included ANAMAX share of Palo Verde deposit for 1979-1982.

(2 Combined as Mission Complex in 1985.

(3 Ray Unit acquired from Kennecott November 18, 1986.

(4 Grade reported for Ray Unit is an average of oxide and sulfide together through 1982.

(5 Sierrita, Esperanza and Mineral Park acquired from Duval Corp. April 1, 1986.

(6 Combined Metcalf and Morenci mines production in 1983 et seq.

(7 Bluebird property acquired by Inspiration in 1984.

(8 Weighted average grade of ore milled, based generally on an assay of total copper.

Source: Company annual reports, Form 10-K's and Prospectus; Personal correspondence and Arizona Department of Mines and Mineral Resources.

TABLE VII

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES *(1*

(Percent of Total Copper)

MINE OPERATION		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
ANAMAX MINING COMPANY											
Twin Buttes *(2*	Sulfide	76	85	87	85	--	--	--	--	--	--
	Oxide	79	78	76	77	87	(80 est)	80	(80 est)	--	--
ASARCO INCORPORATED											
Mission *(3*	Sulfide	87	75	87	94	85	80	(80 est)	92	91	89
Pima *(3*	Sulfide	--	76	84	76	89	--	--	--	--	--
Ray *(4*	Sulfide	--	--	--	70	70	(70 est)	83	81	82	84
Sacaton	Sulfide	83	78	--	--	--	--	--	--	--	--
San Xavier *(3*	Sulfide	--	82	66	76	78	79	(80 est)	--	--	--
Silver Bell	Sulfide	78	--	--	--	--	--	--	--	--	--
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	83	82	76	94	83	83	92	91	93	90
	Oxide	--	--	--	--	--	--	52	51	54	42
Johnson	Oxide	96	79	86	86	--	62	(62 est)	--	--	--
Esperanza *(5*	Sulfide	--	--	90	87	--	--	--	--	--	--
Mineral Park *(5*	Sulfide	76	73	84	75	--	--	--	--	--	--
Sierrita *(5*	Sulfide	91	87	86	80	98 (?)	(88 est)	89	92	91	89
INSPIRATION CONSOLIDATED COPPER CO.											
Christmas (OP)	Sulfide	--	--	70	71	--	--	--	--	--	--
Inspiration *(6*	Mixed	55	53	81	74	68	86	80	76	66	69

(continued)

TABLE VII (CONT)

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES *(1*

(Percent of Total Copper)

MINE OPERATION		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	89	84	83	94	95	--	88	80	84	82
San Manuel	Sulfide	85	83	95	87	89	86	90	90	90	85
Superior	Sulfide	90	91	95	93	(93 est)	--	--	--	--	--
PHELPS DODGE CORP.											
Metcalf	Sulfide	61	59	58	--	--	--	--	--	--	--
Morenci *(7*	Sulfide	77	68	64	69	68	71	70	86	76	74
New Cornelia	Sulfide	84	80	79	78	85	78	76	--	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now HECLA MINING CO.)											
Bluebird *(8 (9*	Oxide	85	36	41	156	--	--	--	--	--	--

(1 Recoveries are based on available reported production and average grade of material treated.
(2 Recovery includes ANAMAX's share of Palo Verde 1979-1981-1982-1983-1984.
(3 Combined as Mission Complex in 1985.
(4 Ray Unit acquired from Kennecott, November 18, 1986.
(5 Sierrita, Esperanza, and Mineral Park acquired from Duval Corp., April 1, 1987.
(6 Percent recovery by leaching since 1986.
(7 Includes Metcalf production, 1983-1985.
(8 Bluebird property acquired by Inspiration in 1984.
(9 Recovery by leaching heaps continued after mining was terminated in July 1981.

Source: Personal correspondence with individual companies.

TABLE VIII

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES *(1*

(Waste:Ore)

MINE OPERATION	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
ANAMAX MINING COMPANY										
Twin Buttes	2.00:1	2.90:1	3.32:1	3.62:1	2.05:1	1.14:1	--	--	--	--
ASARCO INCORPORATED										
Eisenhower *(2 (3*	--	--	--	0.71:1	0.67:1	0.57:1	1.26:1	--	--	--
Mission *(3*	2.30:1	0.76:1	3.05:1	2.01:1	1.62:1	2.52:1	1.32:1	0.74:1	0.84:1	1.05:1
Pima *(3*	--	5.20:1	6.28:1	3.06:1	1.42:1	--	--	--	--	--
Ray *(4*	3.10:1	2.70:1	3.15:1	1.88:1	2.30:1	2.72:1	2.11:1	2.27:1	2.12:1	1.99:1
Sacaton	2.70:1	3.10:1	2.02:1	1.30:1	0.70:1	0.35:1	0.10:1	--	--	--
San Xavier *(3*	1.10:1	1.10:1	6.01:1	6.18:1	2.90:1	0.96:1	1.97:1	--	--	--
Silver Bell	1.40:1	1.50:1	--	1.41:1	--	1.09:1	1.17:1	--	--	--
CYPRUS MINES CORPORATION										
Bagdad	1.70:1	1.80:1	1.52:1	1.78:1	1.45:1	1.53:1	0.94:1	0.42:1	0.54:1	0.77:1
Esperanza *(5*	--	1.30:1	0.76:1	1.95:1	--	--	--	--	--	--
Johnson	2.50:1	1.30:1	2.01:1	1.52:1	--	0.03:1	--	--	--	--
Mineral Park *(5*	1.50:1	1.70:1	1.71:1	1.44:1	--	--	--	--	--	--
Sierrita *(5*	1.30:1	1.10:1	1.11:1	0.98:1	0.55:1	0.33:1	0.76:1	0.55:1	0.19:1	0.40:1
INSPIRATION CONSOLIDATED COPPER COMPANY										
Christmas	--	--	4.40:1	3.24:1	--	--	--	--	--	--
Inspiration	2.80:1	3.40:1	2.40:1	1.53:1	1.42:1	0.27:1	1.72:1	1.50:1	1.82:1	2.04:1
MAGMA										
San Manuel Oxide	--	--	--	--	--	--	--	--	1.70:1	2.46:1
Pinto Valley	1.60:1	1.80:1	1.07:1	1.77:1	1.80:1	--	0.79:1	1.01:1	1.21:1	1.32:1

(continued)

TABLE VIII (CONT)

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES *(1*

(Waste:Ore)

MINE OPERATION	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
PHELPS DODGE CORPORATION										
Metcalf	1.50:1	2.30:1	1.67:1	--	--	--	--	--	--	--
Morenci *(6*	1.50:1	1.40:1	1.30:1	1.63:1	0.79:1	0.64:1	0.90:1	0.68:1	0.76:1	1.10:1
New Cornelia	1.40:1	1.00:1	2.27:1	0.48:1	1.21:1	0.30:1	0.58:1	--	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORP. (Now HECLA MINING CO.)										
Bluebird *(7 (8*	1.50:1	1.50:1	1.50:1	0.003:1	--	--	--	--	--	--
WEIGHTED AVERAGE*	1.75:1	1.75:1	1.90:1	1.57:1	1.31:1	0.57:1	1.10:1	0.88:1	0.96:1	1.21:1

(1 Leachable rock included with waste (except at solely leach operations).
(2 Mining was done by ASARCO, includes ANAMAX's share of ore.
(3 Combined as Mission Complex 1985.
(4 Ray Unit acquired from Kennecott November 18, 1986.
(5 Sierrita, Esperanza and Mineral Park acquired from Duval April 1, 1986.
(6 Combined Morenci and Metcalf 1984-1985.
(7 Stripping of overburden ceased in January 1981, but mining continued until July.
(8 Bluebird Property acquired by Inspiration in 1984.

Source: "Minerals Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Company Annual Reports; E&MJ International Directory of Mining and Mineral Processing Operations; Arizona Department of Mines & Mineral Resources; Company submitted data beginning in 1985.

*NOTE: These are now weighted averages so use caution in making comparisons to the averages presented in previous editions of this report prior to 1981.

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER

RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1972	165,914,825	102,526 5,987,518	6,614,957 11,143,226	27,126 46,791	1,695,858,000 858,392,446	10.22 50.617	922,314,190
1973	181,311,945	102,376 10,013,397	7,164,988 18,325,173	37,657 59,372	1,735,012,000 1,021,314,814	9.57 58.865	1,109,025,384
1974	178,913,296	90,206 14,488,424	6,308,721 29,701,332	28,346 57,067	1,609,808,000 1,233,901,735	9.00 76.649	1,335,158,491
1975	168,750,152	82,759 13,364,751	6,190,805 27,354,196	25,030 61,411	1,502,978,000 954,917,072	8.91 63.535	1,057,047,019
1976	194,136,559	97,961 12,276,473	7,308,395 31,816,805	31,073 89,148	1,912,430,000 1,316,210,823	9.85 68.824	1,449,452,101
1977	168,641,401	87,874 13,032,593	6,696,415 30,957,660	34,574 120,497	1,705,240,000 1,122,184,339	10.11 65.808	1,166,295,089
1978	178,204,491	92,508 17,905,108	6,611,781 35,709,502	33,029 150,142	1,817,670,000 1,190,755,617	10.20 65.510	1,244,520,369
1979	203,977,408	99,549 30,622,766	7,454,306 82,699,941	35,101 213,065	1,914,501,095 1,767,735,441	9.39 92.334	2,094,081,895
1980	169,650,401	71,533 43,814,606	5,640,703 116,376,559	36,299 324,150	1,521,850,812 1,543,400,219	8.97 101.416	2,027,741,384

(continued)

TABLE IX (CONT)

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER

RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1981	216,787,430	95,496	7,565,368	35,600	2,143,898,000	9.89	
		43,891,299	79,575,340	273,052	1,795,385,941	83.744	2,191,904,580
1982	146,124,870	61,050	6,301,000	22,099	1,697,500,000	11.62	
		22,949,000	50,090,000	100,673	1,261,415,000	74.31	1,435,127,000
1983	152,902,150	61,991	4,492,000	23,934	1,495,208,000	9.78	
		26,284,000	51,383,000	79,459	1,144,285,000	76.53	1,301,411,000
1984	145,278,431	51,548	4,093,000	23,184	1,582,549,000	10.89	
		18,591,200	33,320,000	78,827	1,044,483,000	66.00	1,175,151,000
1985	159,547,970	52,053	4,885,000	30,428	1,778,334,456	11.14	
		16,585,000	30,007,000	98,827	1,166,571,000	65.60	1,311,990,000
1986	153,439,000	63,334	4,202,000	29,382	1,752,525,000	11.42	
		23,370,000	22,987,000	75,607	1,157,543,000	66.05	1,279,507,000
1987	166,113,000	48,991 (P	3,217,000 (P	15,939	1,724,068,000	10.38	
		21,747,000	23,161,000	51,802	1,370,924,000	79.52	1,467,340,000

(1 Molybdenum content of recovered concentrate.
(2 Excludes precipitate copper from dump and in-place leaching prior to 1982.
(3 At average annual domestic, free market gold price.
(4 At E&MJ average annual N.Y. market price for .999 fine silver.
(5 At E&MJ average annual price, U.S. Producer Cathode Preliminary.
(P Preliminary.

TABLE X

NONFUEL MINERAL PRODUCTION IN ARIZONA *(1*

Mineral	1986 Quantity	1986 Value (thousands)	1987 *(P* Quantity	1987 *(P* Value (thousands)
Clays ----------thousand short tons--	201	$1,366	212	$1,482
Copper (recoverable content of ores, etc.) ----metric tons--	789,175	1,149,193	777,301	1,370,924
Gem stones ----------	NA	2,533	NA	2,836
Gold (recoverable content of ores, etc.) ------troy ounces--	63,334	23,370	48,991	21,747
Gypsum ----------thousand short tons--	260	1,820	262	1,832
Lead (recoverable content of ores, etc.) ------metric tons--	W	W	--	--
Lime ----------thousand short tons--	505	21,016	539	22,431
Molybdenum ----------thousand pounds--	29,382	75,607	15,939	51,802
Pumice ----------thousand short tons--	2	30	4	26
Sand and gravel (construction) ----------do-------	40,468	140,004	38,200 *(e*	140,500 *(e*
Silver (recoverable content of ores, etc.) thousand troy ounces--	4,202	22,987	3,217	23,161
Stone (crushed) ----------thousand short tons--	5,600 *(e*	25,100 *(e*	5,200	22,400
Combined value of cement, perlite, pyrites (1985), salt (1986-87), sand and gravel (industrial), stone (dimension), and values indicated by symbol W ----------	XX	116,379	XX	124,239
Total ----------	XX	1,579,405	XX	1,783,380

(e Estimated.
(P Preliminary.
NA Not applicable.
W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure.
XX Not applicable.
(1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Source: "The Mineral Industry of Arizona in 1987" Mineral Industry Surveys, U.S. Bureau of Mines.

TABLE XI

COPPER MINE CAPACITY IN ARIZONA *(1*
(Short tons of Recoverable Copper/Year)

OPERATOR	MINE	CAPACITY
Phelps Dodge	Morenci/Metcalf	270,000
Magma	San Manuel	130,000
Asarco	Ray	122,000
Cyprus	Sierrita/Esperanza	120,000
Magma	Pinto Valley	85,000
Cyprus	Bagdad	85,000
Inspiration	Inspiration Area	77,000
ASARCO	Mission Complex	62,000
Phelps Dodge	New Cornelia	40,000
Cyprus	Mineral Park	17,000
Cyprus	Casa Grande	16,000
Inspiration	Christmas	8,000
Magma	Miami	6,000
Magma	Copper Cities	2,000
Phelps Dodge	Copper Queen/Lavender	2,000
TOTAL		1,042,000

1) Figures generally represent a current estimate of the productive capacity of primary recoverable copper in concentrates, precipitates, and cathodes. Figures do not represent smelter or refinery capacity. The estimates are based on recent production figures and on capacities of concentrator and leach plant facilities. Other factors affecting actual production include, for example, grade of ore and recovery. Some capacities have been published by the reporting company.

Source: Arizona Department of Mines & Mineral Resources file data; Company Annual Reports and Form 10-K; Professional Publications.

TABLE XII

MINE PRODUCTION OF COPPER IN THE UNITED STATES

Short Tons

	1983	1984	1985	1986	1987
ARIZONA	747,604	822,823	878,052	869,915	858,769
IDAHO	3,920	4,080	3,914	*(b)*	*(b)*
MISSOURI	8,515	6,413	14,782	*(b)*	*(b)*
MONTANA	36,748	24,109	16,636	*(b)*	*(b)*
UTAH	187,118	*(b)*	*(b)*	*(b)*	*(b)*
OTHER STATES *(a)*	160,401	357,996	305,504	394,740	546,337
TOTAL	1,144,306	1,215,421	1,218,888	1,264,655	1,405,104

(a) *Includes California, Colorado, Illinois, Michigan, Nevada, New Mexico and Tennessee.*
(b) *Included in "Other States".*

Source: American Bureau of Metal Statistics, Inc., Non-Ferrous Metal Data 1987, p. 25.
Derived from U.S. Bureau of Mines data.

TABLE XIII

COPPER SMELTERS
North America
End of 1987-Short Tons

Company	Location Of Plant	Annual Capacity
United States		
ASARCO Incorporated		
El Paso Smelter	El Paso, TX	576,000
Hayden Smelter	Hayden, AZ	940,000
Hayden-Ray Smelter	Hayden, AZ	360,000
BP Minerals America		
Kennecott Utah Copper	Garfield, UT	820,000
Chemetco Inc.	Alton, IL	150,000
Copper Range Company	White Pine, MI	70,000
Inspiration Consolidated		
Copper Company	Claypool, AZ	408,000
Magma Copper Company		
San Manuel Division	San Manuel, AZ	800,000
Phelps Dodge Corporation		
Tyrone Branch	Playas, NM	750,000
Tennessee Chemical Company	Copperhill, TN	18,000
Total *(a)*		**4,892,000**
Canada		
Falconbridge Ltd.	Falconbridge, Ont.	700,000
Gaspe Mines	Murdochville, Que.	357,000
Hudson Bay Mining and Smelting		
Co., Ltd.	Flin Flon, Manitoba	340,000
Inco Ltd.	Copper Cliff, Ont.	1,800,000
Noranda Mines, Ltd.	Noranda, Que.	1,000,000
Total *(a)*		**4,197,000**
Mexico		
Cia. Minera De Santa Rosalia, S.A.	Santa Rosalia, Baja, CA	100,000
Compania Minera De Cananea, S.A.	Cananea, Son.	277,000
Industrial Minera Mexico, S.A.	San Luis Potosi	42,000
Mexicana De Cobre, S.A. De C.V.	Nacozari, Sonora	672,000
Total *(a)*		**1,091,000**

The capacity of copper smelting is given as estimated by the respective proprietors.
(a) Tons of material.

Source: American Bureau of Metal Statistics Inc.

TABLE XIV

COPPER PRODUCTION BY COMPANIES *(g*
Short Tons

	1983	1984	1985	1986	1987
	United States				
Anaconda Copper Company (own mines) *(d*	43,243	14,933	--	--	--
Anamax Mining Company	49,108	25,709	9,864	--	--
ASARCO Incorporated	110,746	103,710	85,470	98,268	194,682
BP Minerals America (U.S. mines) *(l*	318,000	303,000	235,000	190,000	60,000
Cominco American Incorporated And Dresser Minerals *(e*	869	1,045	1,192	1,892	1,925
Copper Range Company *(f*	26,575	24,761	--	31,298	53,053
Cyprus Bagdad Copper Company	81,033	23,876	83,671	86,920	91,340
Cyprus Casa Grande *(m*	--	--	--	--	879
Cyprus Johnson Copper Company	4,859	4,401	3,100	2,436	--
Cyprus Mineral Park	--	--	--	--	2,203
Cyprus Pinos Altos	--	--	--	--	130
Cyprus Sierrita Corporation	71,510	92,204	110,690	56,089	78,985
Hecla Mining Company *(a*	1,283	742	749	346	289
Coeur Mine *(j*	56	61	61	62	58
Galena Mine *(k*	307	172	154	141	121
Lucky Friday Mine	756	442	534	143	110
Sunshine Mine	164	67	--	--	--
Inspiration Consolidated Copper Company *(f*	40,778	44,112	40,402	32,085	35,582
Magma Copper Company *(n*	99,705	120,345	108,642	112,513	197,013
Pinto Valley Division	10,264	56,507	90,839	97,544	75,550
San Manuel Division	99,705	120,345	108,642	112,513	121,463
Montana Resources	--	--	--	8,876	30,856
Noranda Lakeshore Mines, Inc. *(b*	18,760	7,701	6,779	3,581	--
Phelps Dodge Corporation (U.S. mines) *(b*	263,100	331,232	410,076	405,400	468,900
Tennessee Chemical Company	11,725	9,245	8,450	7,475	4,560
Refiners *(c*	401,567	451,603	442,705	439,612	447,717
AMAX Copper, Inc.	126,799	105,226	28,508	--	--
ASARCO Incorporated	274,768	346,377	414,197	441,612	447,717

(a Includes Hecla's share of production from each mining property.
(b Includes copper produced from purchased ores.
(c The totals for these concerns are to a large extent duplications of the reports of other producers.
(d Includes Anaconda's 50% share of Anamax Mining Company.
(e Magmont mine.
(f Refined production.
(g Copper content of mine production unless otherwise noted.

(continued)

TABLE XIV (CONT)

(h Mine abandoned in 1979.
(i Mine abandoned in 1981.
(j Operated by ASARCO - Shows Hecla Mines share of 5%.
(k Operated by ASARCO - Shows Hecla Mines share of 25%.
(l Reported production of refined copper plus unrefined copper sales. Includes only Kennecott's share from jointly owned properties.
(m Formerly Noranda Lakeshore.
(n Refined copper contained in concentrates produced and SX-EW production.

Source: American Bureau of Metal Statistics.

TABLE XV

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1983	1984	1985	1986	1987
Ore, Matte & Regulus	**102,807**	**17,075**	**7,710**	**5,977**	**12,765**
Canada	41,304	4,084	2,820	2,147	4,093
Mexico	34,350	249	19	--	6,753
Honduras	2,260	254	83	--	--
Argentina	--	--	--	18	--
Bolivia	26	--	--	--	7
Chile	7,596	2,597	77	71	--
Peru	4,407	1,175	1,265	1,431	1,474
Venezuela	--	--	664	--	--
Netherlands	433	166	--	--	--
India	--	3	--	--	--
Japan	11	218	524	639	--
Philippines	9,270	6,313	--	--	--
Taiwan	--	18	--	--	--
Botswana	1	--	--	--	--
South Africa	363	--	108	--	--
Australia	2,786	1,998	2,150	1,671	438
Blister Copper	**87,588**	**66,340**	**28,635**	**51,049**	**47,991**
Canada	4,547	5	2,559	3,248	15
Mexico	10,206	7,610	2,117	20,068	15,457
Argentina	1,808	--	--	--	--
Chile	66,255	51,555	19,823	27,409	21,532
Peru	3,803	6,902	3,819	--	2,921
Belgium	--	--	--	--	95
Germany, F.R.	19	76	72	269	2,189
United Kingdom	--	--	--	--	--
Egypt	854	--	--	--	5,782
Zambia	--	--	--	55	--
Other Countries	96	192	245	--	--
Refined Cathodes & Shapes	**532,399**	**555,968**	**415,675**	**541,990**	**556,973**
Canada	100,669	202,957	141,085	219,969	231,078
Mexico	--	--	1,780	1,419	611
Chile	297,368	169,826	167,548	164,436	159,915
Peru	34,458	58,509	38,714	59,035	46,716
Belgium	6,363	13,359	5,865	2,386	702
Finland	78	139	119	--	59
France	20	63	43	--	--
Germany, F.R.	1,097	441	1,209	--	34,680
Italy	21	20	--	--	20
Netherlands	40	80	--	--	7,043
Norway	279	1,959	886	--	205
Sweden	--	--	--	--	26,788
United Kingdom	346	41	3,541	6,381	--

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Yugoslavia	--	--	--	--	4,629
Japan	10,120	4,163	5,241	--	661
South Korea	3,307	910	2,393	--	--
Philippines	--	1,050	--	--	--
Taiwan	--	--	--	--	300
Congo (Brazzaville)	--	--	--	3,155	--
Ghana	3,816	--	--	--	--
South Africa	15,114	555	6,453	11,101	5,046
Zaire	32,082	30,907	30,057	39,688	26,446
Zambia	27,221	64,501	9,821	32,714	21,834
Australia	--	3,270	8	--	--
China	--	--	--	--	165
Other Countries	--	3,218	912	1,706	75
Waste & Scrap (unalloyed)	**25,450**	**25,362**	**25,368**	**29,984**	**36,510**
Waste & Scrap (alloyed)	**34,597**	**34,267**	**25,591**	**31,635**	**36,528**
Copper in Rolls, Sheets or Rods	**26,620**	**43,007**	**41,870**	**41,473**	**33,510**
Canada	6,027	12,014	14,202	10,386	12,466
Mexico	188	11	134	--	137
Argentina	--	--	--	--	100
Brazil	2,829	3,792	2,333	2,454	1,338
Chile	1,220	1,949	1,486	7,277	2,666
Peru	299	662	909	619	747
Belgium	226	169	1,068	880	104
Finland	1,147	2,715	2,208	2,180	3,087
France	2,264	1,916	1,808	704	75
Germany, F.R.	4,182	10,020	7,451	6,468	3,466
Italy	347	1,401	975	907	391
Netherlands	57	50	129	210	308
Sweden	1,389	2,408	3,151	2,843	1,572
United Kingdom	91	166	135	312	258
Yugoslavia	883	433	696	479	311
Japan	3,392	4,604	3,559	3,664	4,408
South Korea	--	--	--	538	213
South Africa	265	143	412	528	14
Zaire	--	--	--	--	550
Australia	1,038	264	154	535	1,211
Other Countries	770	225	1,022	489	88
Copper Seamless Tube & Tubing	**27,499**	**32,694**	**32,398**	**42,485**	**49,416**
Canada	3,778	5,767	5,502	6,490	6,451
Mexico	5,449	3,281	955	6,496	12,180
Brazil	--	707	224	--	120
Chile	140	151	297	400	315
Austria	--	--	--	--	55
Belgium	--	--	--	--	20
Finland	--	714	970	236	265
France	--	183	219	446	416

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Germany, F.R.	327	729	837	702	603
Greece	--	--	--	--	30
Italy	--	--	--	289	1,476
Portugal	--	--	--	--	31
Sweden	--	--	--	--	115
Switzerland	--	--	--	--	25
United Kingdom	27	164	126	295	187
Japan	16,840	20,394	22,833	26,514	27,016
South Korea	--	--	--	--	92
Other Countries	933	598	428	617	19
Brass Rods, Sheets, Plates, Bars & Strip	**58,297**	**93,024**	**68,028**	**63,946**	**54,430**
Canada	3,580	5,572	3,482	2,292	3,823
Mexico	1,795	1,234	190	1,503	4,513
Argentina	198	329	695	2,163	1,680
Brazil	5,813	15,101	8,929	7,098	2,985
Peru	--	--	--	--	484
Belgium	289	404	409	--	225
Denmark	--	--	--	--	256
France	5,470	12,363	6,081	5,400	3,249
Germany, F.R.	19,764	26,906	18,575	16,390	10,785
Italy	1,384	3,182	3,591	2,592	1,449
Netherlands	4,247	6,728	5,449	5,048	5,918
Sweden	290	607	1,808	774	718
Switzerland	1,343	1,432	1,789	2,428	2,422
United Kingdom	810	1,403	686	456	892
Yugoslavia	939	2,306	1,557	1,590	1,749
Israel	1,259	1,322	1,141	1,095	1,064
Japan	8,159	7,059	7,481	8,771	7,880
South Korea	--	--	--	3,618	444
South Africa	819	1,188	648	630	444
New Zealand	--	--	--	--	399
Hungary	358	796	539	684	1,442
Poland	--	--	--	--	1,156
Other Countries	1,205	5,026	4,920	1,414	453
Copper & Alloyed Foil *(a*	**28,008**	**39,717**	**33,951**	**31,129**	**37,590**
Canada	5,205	7,900	5,763	5,219	6,830
Belgium	93	46	--	--	192
France	308	544	36	--	18
Germany, F.R.	769	2,061	1,033	1,057	2,451
Ireland	--	--	--	--	601
Netherlands	7,976	9,047	8,968	8,978	10,353
Sweden	10,529	13,785	13,732	13,248	14,856
United Kingdom	1,109	2,488	631	518	437
Japan	1,661	2,533	2,303	1,518	1,727
Other Countries	358	1,313	1,485	591	125

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Brass Seamless Tube & Tubing	**17,259**	**22,798**	**20,212**	**21,171**	**18,786**
Canada	3,447	4,303	2,443	1,025	1,154
Mexico	143	672	185	918	958
Brazil	174	500	359	575	136
Chile	--	--	--	--	90
Belgium	--	--	--	--	59
France	335	77	39	--	36
Germany, F.R.	7,919	10,457	9,340	9,438	8,545
Greece	59	225	116	127	317
Italy	252	504	1,282	1,537	101
Netherlands	--	392	250	--	51
Portugal	--	--	--	164	170
Spain	2	9	2	--	--
Switzerland	12	19	44	--	86
United Kingdom	132	326	211	--	130
Yugoslavia	307	674	592	535	390
Israel	156	270	311	332	364
Japan	3,897	3,619	3,665	4,049	4,155
South Korea	175	459	444	719	479
South Africa	44	4	699	1,289	1,364
Other Countries	205	288	230	463	201
Copper Alloyed Wire	**4,334**	**5,362**	**4,757**	**8,026**	**8,439**
Copper Wire Insulated *(b*	44,977	68,190	83,016	95,201	103,597
Canada	22,704	36,057	36,393	33,491	34,523
Mexico	2,129	5,592	6,683	10,528	23,276
Costa Rica	--	--	--	2,757	2,350
Brazil	2,317	3,893	5,904	4,141	3,157
Chile	669	132	918	1,444	829
Peru	1,156	356	5,251	4,499	3,587
Venezuela	--	--	--	3,427	3,276
France	1,129	1,699	2,598	2,538	4,130
Germany, F.R.	614	1,127	921	--	1,171
Italy	1,016	2,169	3,111	3,011	1,763
Spain	258	1,025	3,227	4,205	3,728
Sweden	62	49	85	--	59
United Kingdom	1,085	789	718	--	277
Yugoslavia	2,846	1,837	2,595	2,898	3,072
Israel	472	732	810	--	616
Japan	4,952	3,396	3,149	6,862	4,329
South Korea	794	488	3,274	5,797	4,914
Taiwan	--	--	--	5,563	7,342
Other Countries	2,774	8,849	7,379	4,040	1,198

(a) Metal weight. (b) Gross weight.

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census. Current monthly data available, report 010, for the above table on an annual subscription basis.

TABLE XV (CONT)

Copper Exports of the United States by Countries

Copper Content-Short Tons

	1983	1984	1985	1986	1987
Ore, Concentrate & Matte	**47,110**	**67,240**	**128,206**	**192,183**	**137,512**
Canada	92	87	3,050	6,993	2,013
Belgium	--	212	100	--	--
Finland	--	--	--	5,096	7,968
Germany, F.R.	7,696	1,694	--	--	976
Netherlands	--	11	--	--	--
Yugoslavia	--	--	--	--	4,113
India	124	33	--	--	111
Israel	--	2	--	--	--
Japan	32,330	62,004	113,352	145,103	109,737
South Korea	--	3,195	7,628	15,548	5,681
Taiwan	6,868	--	4,076	5,505	4,162
China	--	--	--	13,771	2,723
Other Countries	--	--	--	167	28
Blister Copper	**8,213**	**9,237**	**19,817**	**17,598**	**13,600**
Canada	397	430	408	437	922
Mexico	15	47	2,804	--	303
Chile	28	4	--	--	--
Venezuela	--	--	--	--	72
Austria	--	556	--	--	--
Belgium	26	784	--	--	--
Germany, F.R.	141	257	100	--	--
Netherlands	--	276	--	--	--
Portugal	--	--	--	125	281
Spain	--	--	--	100	5
United Kingdom	--	--	--	--	15
Hong Kong	68	213	6	185	784
Indonesia	--	--	--	--	193
Japan	8	18	--	776	4,706
South Korea	7,194	6,480	16,177	14,879	5,122
Philippines	--	--	--	--	98
Singapore	15	72	76	94	112
Taiwan	68	84	93	636	521
Australia	--	--	--	139	380
Other Countries	321	100	246	227	86
Refined Ingots, Bars, Etc.	**96,482**	**103,532**	**53,037**	**16,446**	**19,784**
Canada	2,739	4,513	6,165	5,357	4,943
Mexico	9,613	3,288	12,729	317	4,674
Dominican Republic	--	--	--	--	46
Brazil	3	123	53	126	501
Venezuela	19	13	27	149	134
Belgium	812	51	671	--	391
France	708	955	318	516	535

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Germany, F.R.	2,423	1,401	1,439	1,533	514
Italy	--	--	--	--	218
Netherlands	66,941	7,387	19,343	305	276
Spain	69	126	2	--	--
Sweden	134	9	76	--	--
Switzerland	65	46	40	108	49
United Kingdom	486	1,080	806	2,469	1,185
Hong Kong	32	168	1,050	661	458
India	86	32	24	--	61
Israel	13	14	30	--	2
Japan	8,031	78,568	5,605	--	3,036
South Korea	6	1,737	1,146	1,473	2,063
Singapore	3	64	--	--	2
Taiwan	1,130	3,539	1,609	2,835	658
Ghana	--	--	--	246	--
Australia	14	7	4	--	--
China	2,375	55	25	--	--
Other Countries	780	356	1,875	351	38
Copper Waste & Scrap (unalloyed)	**52,897**	**89,075**	**148,040**	**150,375**	**119,636**
Canada	14,742	12,399	18,277	15,149	12,273
Mexico	9,373	14,915	13,507	6,488	13,533
Brazil	--	--	1,875	4,374	3,326
Venezuela	--	--	--	--	217
Belgium	2,677	2,209	10,383	3,552	2,154
Finland	--	--	--	--	97
France	19	57	182	--	--
Germany, F.R.	757	3,270	18,654	9,385	4,774
Italy	--	839	7,553	13,585	6,769
Netherlands	172	1,085	4,395	1,887	406
Spain	399	2,058	5,292	6,191	8,877
Sweden	61	487	234	--	2
United Kingdom	486	572	4,303	1,637	822
Hong Kong	79	446	1,590	6,312	3,656
India	2,563	1,288	1,102	792	545
Japan	3,822	16,878	14,829	13,835	17,141
South Korea	16,348	14,528	15,284	13,632	10,650
Philippines	--	--	--	--	1,045
Singapore	--	--	1,062	754	1,262
Taiwan	1,341	17,539	27,650	51,694	31,651
Thailand	9	8	8	--	--
Australia	--	78	58	--	157
China	--	--	--	--	210
Other Countries	49	419	2,864	1,108	69
Copper-Base Alloy, Waste & Scrap *(a)*	**88,472**	**115,659**	**160,791**	**167,121**	**204,236**
Canada	19,117	33,638	26,421	22,628	23,321
Mexico	6,016	2,655	4,239	935	6,308
Trinidad	--	--	--	--	776

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Brazil	--	--	401	4,363	7,037
Venezuela	1	262	374	--	141
Austria	--	--	--	--	310
Belgium	5,229	3,422	6,960	6,187	8,019
France	299	224	227	--	106
Germany, F.R.	2,909	3,996	18,814	5,325	8,513
Italy	3	2,695	9,804	21,608	7,177
Netherlands	2,154	664	4,315	1,644	885
Spain	490	1,391	7,638	8,595	6,911
Sweden	5,897	2,821	1,994	2,587	1,763
Switzerland	495	513	713	--	180
United Kingdom	482	601	2,296	4,486	2,975
Yugoslavia	--	--	132	--	--
Hong Kong	391	258	1,285	--	576
India	4,289	9,113	15,235	18,254	13,079
Japan	17,765	28,111	27,328	28,317	26,500
South Korea	9,421	8,315	13,692	15,837	28,761
Philippines	--	--	--	--	126
Singapore	155	771	344	--	255
Taiwan	13,291	16,023	16,231	24,153	60,249
China	--	--	--	--	198
Other Countries	68	186	2,749	2,202	70
Copper & Alloyed Foil	223	327	195	667	1,125
Canada	84	114	12	246	532
Mexico	--	--	--	--	7
Honduras	--	--	--	25	--
Venezuela	--	--	--	--	181
Germany, F.R.	13	6	6	6	25
Netherlands	--	--	--	4	2
United Kingdom	9	--	--	7	19
Bahrain	--	--	--	3	--
Hong Kong	--	--	--	62	--
India	--	--	--	6	--
Japan	9	11	22	8	8
South Korea	7	5	6	7	76
Kuwait	--	--	--	31	--
Qatar	--	--	--	--	36
Saudi Arabia	--	--	--	--	7
Singapore	--	--	--	5	--
Taiwan	33	171	76	121	173
Thailand	--	--	--	13	11
United Arab Emirates	--	--	--	115	31
New Zealand	--	--	--	--	3
Other Countries	77	20	73	8	14
Pipes & Tubes	3,991	4,270	5,004	5,890	7,128
Plates & Sheets	1,511	5,122	866	708	594

(continued)

TABLE XV (CONT)

	1983	1984	1985	1986	1987
Unalloyed Copper Bars, Angles, Shapes, Sections & Rods	10,405	13,338	7,396	9,848	15,611
Wire & Cable, Bare	9,163	9,677	8,775	7,915	11,237
Insulated Wire & Cable *(b)*	67,714	65,136	54,754	65,217	95,211
Building Wire & Cable	6,004	3,879	2,265	2,924	2,852
Power Wire & Cable	7,388	6,622	6,852	6,338	13,610
Communication Wire & Cable	23,825	21,211	13,489	21,304	30,108
Copper Magnet Wire	3,679	3,589	2,905	2,279	3,244
Appliance Wire & Cord	5,779	4,511	5,950	6,311	5,189
Other Insulated Wire & Cable	21,039	25,324	23,293	26,061	40,208
Blister Copper *(c)*	--	--	7	4	--
Refined Copper *(c)*	718	2,006	16,736	692	11
Canada	661	9	12	27	--
Mexico	54	1,005	--	--	--
Brazil	--	--	369	--	--
Germany, F.R.	--	--	--	--	11
Netherlands	--	--	10,148	--	--
Japan	3	551	--	--	--
South Korea	--	--	--	665	--
Taiwan	--	441	--	--	--
China	--	--	6,207	--	--

(a) Metal weight. (b) Gross weight. (c) Re-exports, imported foreign merchandise.

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census. Current monthly data available, report 011, for the above table on an annual subscription basis.

TABLE XVI

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1948	11,493	41,318,524	3,595	69.13	39,072,204
1949	11,001	40,612,224	3,692	71.00	37,365,611
1950	10,181	41,994,321	4,125	79.33	41,757,273
1951	10,754	47,825,698	4,447	85.52	42,784,388
1952	11,365	54,950,235	4,835	93.14	44,472,522
1953	12,068	62,742,982	5,199	99.98	45,187,838
1954	12,502	65,518,853	5,241	100.79	43,072,894
1955	12,399	71,293,263	5,750	110.58	52,189,728
1956	14,008	83,568,996	5,966	114.73	60,468,580
1957	14,652	85,125,320	5,809	111.71	59,571,834
1958	14,100	74,726,972	5,300	101.93	56,255,809
1959	11,568	72,095,130	6,232	119.85	53,121,545
1960	13,764	90,312,848	6,562	126.19	66,032,439
1961	14,275	97,271,286	6,814	131.04	71,918,991
1962	14,408	101,920,108	7,074	136.04	78,868,147
1963	14,303	104,291,588	7,292	140.23	80,615,132
1964	14,720	113,792,031	7,730	148.65	86,132,039
1965	15,239	122,163,124	8,016	154.16	92,859,535
1966	17,018	137,187,611	8,061	155.02	101,558,298
1967	13,426	108,427,206	8,076	155.31	74,289,203
1968	15,734	136,089,579	8,649	166.33	101,293,963
1969	19,459	173,183,018	8,900	171.15	127,848,828
1970	21,479	201,665,064	9,389	180.56	150,241,000
1971	21,231	211,978,597	9,984	192.00	149,294,000
1972	23,233	254,717,341	10,964	210.85	165,914,825 (2
1973	25,494	291,294,328	11,426	218.89	181,311,945
1974	27,894	340,832,096	12,219	234.98	178,913,296

(continued)

TABLE XVI (CONT)

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1975	25,950	363,349,178	14,002	269.27	168,750,152
1976	25,631	405,289,034	15,812	304.08	194,136,559
1977	23,373	398,539,789	16,835	323.75	168,641,401
1978	21,092	397,790,419	18,860	362.69	178,204,491
1979	23,239	494,963,476	21,299	409.60	203,997,408
1980	21,602	510,168,454	23,617	454.17	169,650,401
1981	26,031	687,434,789	26,408	507.85	216,787,430
1982	17,182	487,415,292	28,368	545.53	135,768,647
1983	13,864	395,266,852	28,510	548.29	135,301,652
1984	12,556	387,028,537	30,824	592.77	145,278,431
1985	11,155	349,311,047	31,314	602.19	174,218,218
1986	10,848	326,915,975	30,136	579.54	167,808,000
1987	10,340	299,297,407	28,946	556.65	166,113,000

(1 "Covered Employment" by law includes all employees of employers of three or more persons. Prior 1966 only a portion of the workers in smelting, refining and rod fabrication were included in this table.

(2 Mine production in short tons of lode ore from "Arizona, Mine Production by Class of Ore", report by U.S. Bureau of Mines. In 1982 and thereafter the tonnage may include copper-zinc, copper-lead and lead-zinc ore combined to avoid disclosing individual company confidential data.

Source: This report, Table XVII; "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Research and Statistics Unit, Arizona Department of Economic Security.

TABLE XVII

ARIZONA INDUSTRIES COVERED BY UNEMPLOYMENT INSURANCE

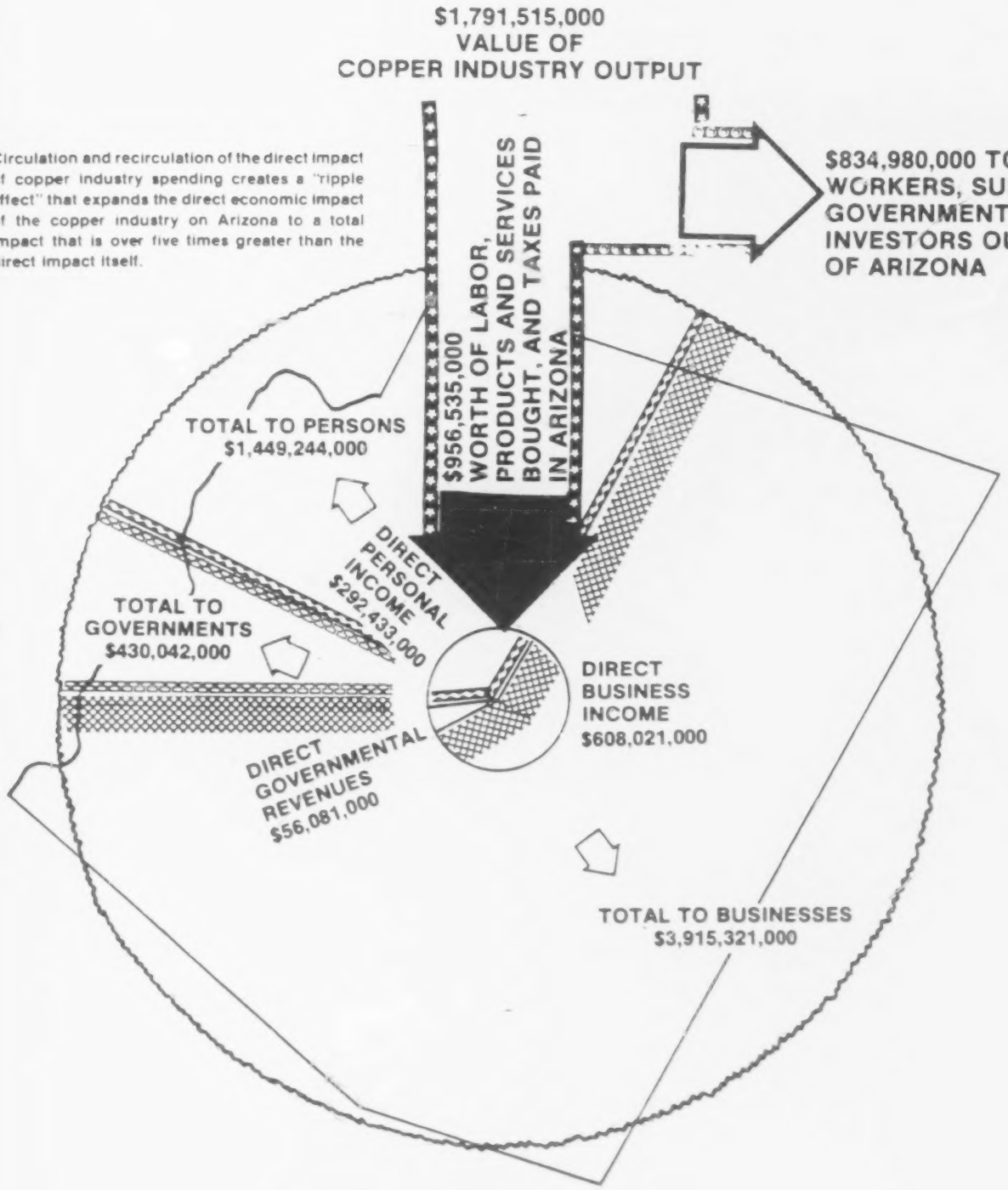
YEAR - 1987

Industry	Average Number of Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage
Copper Mining	8,559	249,140,570	29,109	559.78
Copper Smelting, Refining & Rod Fabrication	1,781	50,156,837	28,162	541.58
TOTAL COPPER MINING & PROCESSING	10,340	299,297,407	28,946	556.65
Other Mining, Quarrying & Processing	2,951	88,078,347	29,847	573.98
ALL MINING, QUARRYING & PROCESSING	13,291	387,375,754	29,146	560.49
Mfg. Except Copper Processing	186,316	4,861,516,141	26,093	501.79
Construction	103,230	2,110,761,306	20,447	393.21
Transportation, Utilities, etc. (2	62,439	1,581,919,452	25,335	487.22
Wholesale-Retail Trade	341,323	4,827,141,741	14,142	271.97
Services, Finance & Misc.	422,457	7,977,698,389	18,884	363.15
Agriculture & Related Services	31,874	367,748,251	11,538	221.88
Federal, State & Local Government	226,693	5,096,435,789	22,482	432.34
TOTAL AND AVERAGES	1,387,623	27,210,596,823	19,610	377.11

(1 Includes all covered employees.
(2 Transportation exclusive of railroads.

Source: Research Administration, Arizona Department of Economic Security

TABLE XVIII


$1,791,515,000
VALUE OF
COPPER INDUSTRY OUTPUT
Circulation and recirculation of the direct impact of copper industry spending creates a "ripple effect" that expands the direct economic impact of the copper industry on Arizona to a total impact that is over five times greater than the direct impact itself.
$956,535,000
WORTH OF LABOR, PRODUCTS AND SERVICES BOUGHT, AND TAXES PAID IN ARIZONA
$834,980,000 TO WORKERS, SUPPLIERS GOVERNMENTS, AND INVESTORS OUTSIDE OF ARIZONA
TOTAL TO PERSONS
$1,449,244,000
DIRECT PERSONAL INCOME
$292,433,000
TOTAL TO GOVERNMENTS
$430,042,000
DIRECT BUSINESS INCOME
$608,021,000
DIRECT GOVERNMENTAL REVENUES
$56,081,000
TOTAL TO BUSINESSES
$3,915,321,000
TOTAL IMPACT: $5,794,607,000

DIRECT AND INDIRECT IMPACTS
OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY
1987

Source: "The Copper Industry's Impact on the Arizona Economy — 1987" by George F. Leaming, Western Economic Analysis Center, Marana, AZ

TABLE XIX

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA (1

Period	All Employees Average No. (Thousands) (2 Ariz.	(3 U.S.	PRODUCTION WORKERS Average No. (Thousands) (4 Ariz.	(5 U.S.	Average Weekly Earnings Ariz.	U.S.	Average Weekly Hours Ariz.	U.S.	Average Hourly Earnings (6 Ariz.	U.S.	Average Earnings Per Man Per Year (7 Ariz.	U.S.	Aggregate Man Hours (Thousands) (8 Ariz.	U.S.
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93	8,997	9,135	33,936	68,570
1971	18.9	34.7	14.9	26.8	178.50	178.46	42.4	42.9	4.21	4.16	9,282	9,280	32,852	59,785
1972	20.5	38.9	16.1	30.7	194.69	192.19	41.6	41.6	4.68	4.62	10,124	9,994	34,827	66,410
1973	21.5	42.3	17.6	33.7	206.75	206.42	41.6	42.3	4.97	4.88	10,751	10,734	38,072	74,127
1974	24.0	42.8	19.1	33.8	222.16	226.46	39.6	41.1	5.61	5.51	11,552	11,776	39,331	72,237
1975	22.5	37.1	17.9	28.4	247.43	247.14	38.6	39.2	6.41	6.33	12,866	12,903	35,929	57,891
1976	21.7	35.5	17.2	27.0	286.31	280.70	40.1	40.1	7.14	7.00	14,888	14,596	35,865	56,300
1977	19.3	35.1	15.3	26.9	302.99	288.73	39.4	38.6	7.69	7.48	15,755	15,014	31,347	53,994
1978	17.2	35.2	13.7	26.9	344.76	338.40	40.8	40.0	8.45	8.46	17,928	17,597	29,066	55,952
1979	19.3	31.9	15.3	24.6	404.81	405.03	42.3	42.5	9.57	9.53	21,050	21,061	33,654	54,366
1980	17.7	29.4	14.0	22.6	446.19	435.01	41.7	41.0	10.70	10.61	23,202	22,621	30,358	48,183
1981	21.9	36.2	17.4	27.9	497.28	492.54	41.2	41.6	12.07	11.84	25,859	25,612	37,278	60,353
1982	15.2	25.3	12.1	18.5	495.60	484.91	38.3	38.7	12.94	12.53	25,771	25,215	24,098	37,229
1983	11.3	18.9	9.0	13.5	519.25	522.69	39.1	39.9	13.28	13.10	27,001	27,180	18,299	28,010
1984	10.5	16.3	8.2	11.4	553.83	562.74	41.3	41.5	13.41	13.56	28,799	29,002	17,610	24,601
1985	9.4	13.1	7.5	9.4	573.80	574.76	41.4	42.2	13.86	13.62	29,838	29,888	16,146	20,627
1986	8.7	11.4	6.9	8.8	582.38	507.99	40.4	41.3	14.42	12.30	30,284	26,415	14,496	18,899
1987	8.6	13.5	6.9	10.7	556.65	492.20	40.1	43.1	13.88	11.42	28,946	25,595	14,388	23,981

(continued)

TABLE XIX (CONT)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA *(1*

Period	Copper Ore Mined (Thousand Short Tons)		Copper Produced (Recoverable Content) (Thousand Pounds)		Worker Productivity: Copper Ore Mined Per Man-Hour (Tons)		Worker Productivity: Copper Produced Per Man-Hour (Pounds)	
	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.
1970	150,241	257,729	1,826,734	3,368,957	4.427	3.759	53.829	49.132
1971	149,294	242,656	1,633,568	2,986,599	4.544	4.059	49.725	49.996
1972	165,815	266,831	1,816,118	3,264,113	4.761	4.017	52.161	49.151
1973	173,605	289,998	1,847,635	3,386,357	4.872	3.912	48.530	45.683
1974	178,821	293,443	1,710,744	3,145,148	4.547	4.062	43.496	43.539
1975	168,656	263,003	1,619,535	2,772,111	4.694	4.543	45.076	47.885
1976	194,046	283,736	2,043,168	3,166,889	5.410	5.040	56.968	56.250
1977	168,601	259,974	1,843,949	2,964,539	5.379	4.815	58.824	54.905
1978	178,201	263,722	1,965,072	2,955,210	6.131	4.713	67.607	52.817
1979	203,977	291,078	2,085,556	3,140,110	6.061	5.369	61.971	57.759
1980	169,650	241,090	1,669,495	2,527,920	5.588	5.004	54.994	52.465
1981	216,787	306,089	2,294,437	3,354,548	5.815	5.072	61.549	55.582
1982	146,125	200,589	1,697,500	2,507,070	6.064	5.388	70.442	67.342
1983	152,902	196,203	1,514,538	2,288,612	8.356	7.005	82.766	81.707
1984	145,278	189,499	1,583,505	2,405,866	8.250	7.703	89.921	97.795
1985	174,218	239,399	1,778,334	2,443,675	10.790	11.606	110.141	118.470
1986	167,808	186,105	1,752,525	2,361,127	11.576	9.847	120.897	124.934
1987	166,113	219,545	1,724,068	2,810,182	11.545	9.155	119.827	117.189

(continued)

TABLE XIX (CONT)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA (1

(1 Statistics do not reflect workers in copper smelting, refining and rod fabrication.

(2 These figures are estimates made by the Arizona Department of Economic Security, in cooperation with the U.S Bureau of Labor Statistics, and they include all full and part-time wage and salary workers who were employed in copper mining in any part of the pay periods which included the 12th of each month of the year.

(3 Estimates made by the U.S. Bureau of Labor Statistics, in cooperation with the 50 states, and based upon monthly samplings similar to those in (2 above, adjusted periodically to census bench mark.

(4 Estimates of production (non-supervisory) workers based upon samplings as in (2 above. Since 1975, figures have been calculated by the Arizona Department of Mines and Mineral Resources dividing the annual number of "All Employees-Arizona" by a factor of 1.26. This factor was derived by comparing the annual number of "All Employees-Arizona" with "Production Workers - Arizona" from 1970 to 1974.

(5 Earnings figures for a particular year is the product of "Average Hourly Earnings" and "Average Weekly Hours" for that year.

(6 Gross payroll aggregates, exclusive of irregular bonuses and other pay not earned in a sample pay period, are divided by gross man-hour aggregates of production and related workers for the period in order to determine average hourly earnings.

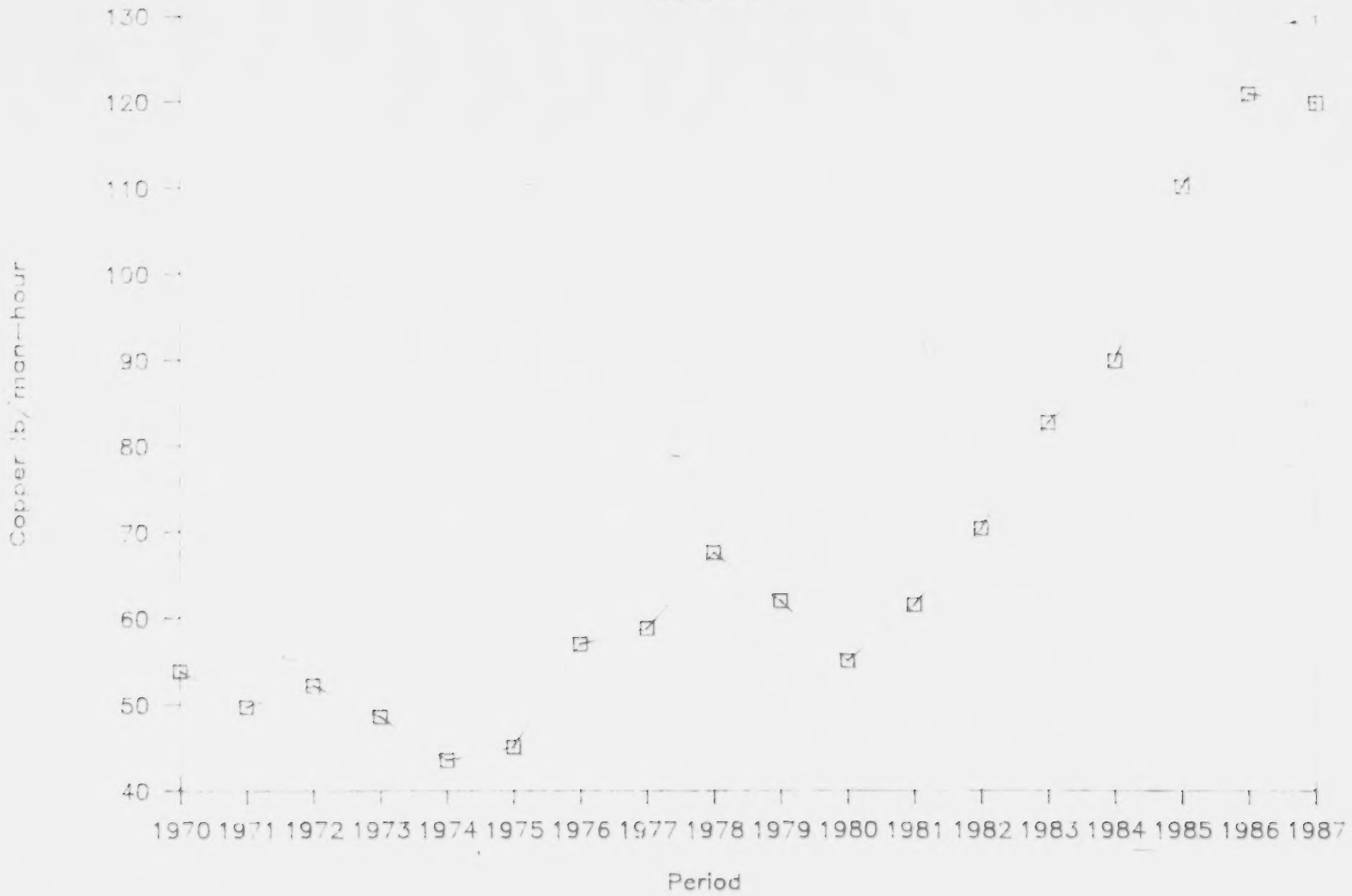
(7 "Average Weekly Earnings" times 52 weeks.

(8 Number of production workers times "Average Weekly Hours" times 52 weeks.

Source: Table I this publication, American Bureau of Metal Statistics, Research and Statistics Unit, Arizona Department of Economic Security: "Mineral Yearbook - Metals, Minerals", U.S. Bureau of Mines. "Employment and Earnings", March issues, U.S. Department of Interior.

Productivity of Arizona Copper Workers

TABLE XIX



Copper Produced (Recoverable Content)

TABLE XIX

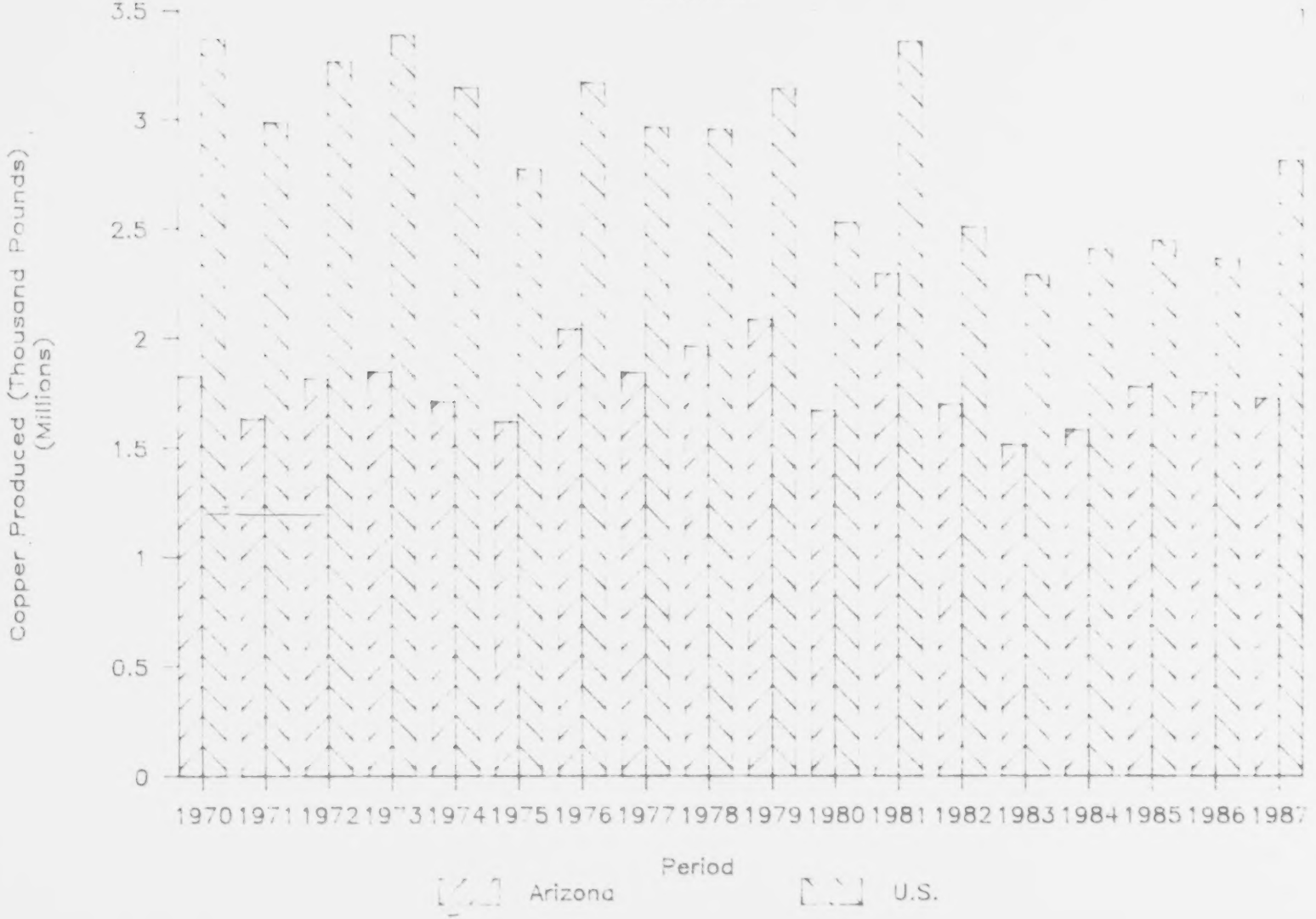


TABLE XX

REFINED COPPER INVENTORIES AT YEAR END
AMOUNTS IN THOUSANDS OF SHORT TONS

Where Held	1983	1984	1985	1986	1987
U.S. refineries	66.1	193.4	150.4	145.1	63.1
Comex warehouses	409.2	276.3	120.3	93.3	18.3
Total U.S.	**475.3**	**469.7**	**270.7**	**238.4**	**81.4**
Refineries elsewhere	352.6	285.7	293.7	277.1	210.0
LME warehouses	480.2	139.3	209.1	193.1	58.3
Total elsewhere	**832.8**	**425.0**	**502.8**	**470.2**	**268.3**
Aggregate inventories	**1308.1**	**894.7**	**773.5**	**708.6**	**349.7**

Source: American Bureau of Metal Statistics. All figures for December 31.

TABLE XXI
AVERAGE QUOTED PRICE OF
ELECTROLYTIC COPPER WIREBAR
DOMESTIC, DELIVERED
U.S. /lb. (1

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
JANUARY	62.625	76.574	119.385	88.570	78.634	80.219	68.792	64.487	69.881	64.986
FEBRUARY	63.593	89.697	133.808	86.071	78.779	84.024	70.748	66.446	68.253	65.525
MARCH	62.410	96.718	106.040	87.382	75.862	82.072	75.311	65.547	70.144	68.071
APRIL	64.625	98.322	94.851	88.033	76.273	83.493	77.388	70.318	68.801	67.129
MAY	64.768	91.234	93.479	85.798	77.948	85.634	72.229	69.864	67.082	70.985
JUNE	66.569	88.241	92.713	85.226	71.488	81.836	69.849	67.094	67.471	74.346
JULY	64.079	86.768	103.565	84.412	71.053	82.947	64.402	66.773	63.815	80.419
AUGUST	67.232	91.335	100.708	87.387	70.999	80.542	64.535	66.284	62.374	82.183
SEPTEMBER	67.632	95.853	98.864	84.722	71.065	77.587	63.408	65.716	64.844	85.607
OCTOBER	70.495	99.106	99.471	82.312	72.413	73.392	62.039	66.680	63.464	88.253
NOVEMBER	71.191	99.708	96.982	81.216	72.968	69.581	65.650	66.294	62.855	108.528
DECEMBER	71.897	106.448	89.127	80.293	74.230	70.805	63.538	68.025	63.630	133.339

(1 MW US Producer Delivered.

Source: Metals Week.

Prepared by: State of Arizona Joint Legislative Budget Committee Staff.

TABLE XXII

AVERAGE COPPER CASH PRODUCTION COSTS FOR THE UNITED STATES, 1982-86 *(1*

(Cents per pound of copper)

PRODUCT COSTS	1982	1983	1984	1985 *(6*	1986	Long run *(2*
Mine op. cost	26	22	20	23	23	26
Mill-Float op. cost	24	24	23	20	21	22
Mill-Leach op. cost	9	7	7			5
Smelt/Refine/Transportation	28	26	24	23	19	24
Taxes *(3*	3	3	2	2	2	3
Total Cost	90	82	76	68	65	80
Byproduct Credits	(13)	(13)	(11)	(9)	(9)	(11)
Cash Cost *(4*	77	69	65	59	56	69
Production Thousand Short Tons *(5* of Copper	989	1,027	1,203	1,222	1,180	1,504

(1 Includes 16 mines, most of which were producing from 1982 to 1986.
(2 Long run costs include depreciation allowances to sustain production.
(3 Property and severance taxes and royalties, if applicable.
(4 Includes all cash cost of production and credit for byproducts but excludes depreciation and profit (except long run costs). Costs are in actual dollars for each year shown.
(5 Based on the production of the 16 mines analyzed. Long run production is estimated full capacity level. Capacities are averaged over the life of the mine.
(6 Includes 13 mines. Mill costs are combined in 1985-6.

Source: U.S. Bureau of Mines Preprint from Bulletin 675 Chapter on Copper. Mineral Facts and Problems, 1985 Edition and 1986 Minerals Yearbook.

TABLE XXIII

COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ANTLER T17N R16W Sec 4	Standard Metals Corp.	Sulfide	5	1.95	With 4.13% Zn, 0.94% Pb, and 1.05 Ag oz/ton. Annual Rpt & Form 10-K, 1987. An additional 2.5 million tons reported in 1979 Annual Report.
ATLAS T11S R8E Sec 32	American Pacific Mining Co. Inc.	Sulfide	5	0.64	Report on BS&K Project, Pima Co., AZ" by Frank H Buchella. Cutoff at 0.40% Cu.
		Acid Soluble	5	0.37	Cutoff at 0.20% Cu.
		Sulfide	19	0.66	Asarco property adjacent to Atlas.
		Acid Soluble	12	0.38	Asarco property adjacent to Atlas.
BAGDAD T14N R9W Sec 4	Cyprus Minerals Co.	Sulfide	43	0.45	With 0.018% Mo. (includes acid soluble) Form 10-K, 1987.
BUCKEYE EAST T3S R12E Sec 26	Asarco Inc.	Acid Soluble	22	0.65	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
CACTUS T1N R13E Sec 36	Magma Copper Co.	Mixed	10	0.70	Cactus Prospect Rpt. Cutoff at 0.2% Cu.
CARLOTA T1N R13E Sec 36	Owens, S.B.	Acid Soluble	4	0.85	Reported 1979.
CASA GRANDE T6S R5E Sec 18	Casa Grande Copper Co.	Mixed	352	1.00	Getty Oil Co. Annual Report, 1980. With 0.01% Mo. Cutoff at 0.5% Cu.
CHILITO T4S R15E Sec 22	Asarco Inc.	Mixed	75	0.51	Chilito Mines Report. With 0.01% Mo, 0.04 oz Ag.
CHRISTMAS (OP)	Inspiration	Sulfide	7	0.63	Inspiration Resources Form 10-K, 1983.
CHRISTMAS (UG) T4S R16E Sec 30	Consolidated Copper Co.	Sulfide	20	1.82	(same as above)

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
COCHISE T23S R24E Secs 9 & 10	Phelps Dodge Corp.	Acid Soluble	170	0.50	Annual Report, 1987.
COPPER BASIN T13N R3W Sec 20	Phelps Dodge Corp.	Sulfide	175	0.55	With 0.021% Mo.
COPPER BUTTE T3S R13E Sec 30	Asarco Inc.	Acid Soluble	22	1.09	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
COPPER CREEK T8S R18E Sec 11	Magma Copper Co.	Sulfide	80	0.55	Old copper reserves data.
COPPER QUEEN T23S R24E Sec 9	Phelps Dodge Corp.	Mixed	1	5.50	Underground. Phelps Dodge Prospectus May 8, 1975.
DOS POBRES T5S R26E Sec 27	Phelps Dodge Corp.	Sulfide	232	0.89	Form 10-K, 1987.
DRAGOON T16S R22E Sec 25	CF & I Steel Corp.	Acid Soluble	25	0.50	0.5 to 0.6 acid soluble copper.
DYNAMITE T17S R13E Sec 30	Smith, V.A. - Estate	Mixed	100	0.53	Unpublished estimate.
EMERALD ISLE T23N R18W Sec 22	TSC Enterprises, Inc.	Acid Soluble	1	0.40	3 million tons at 0.1% Cu USBM RI 8236, Pub. 1977.
ESPERANZA T18S R12E Sec 16	Cyprus Minerals Co.	Sulfide	48	0.27	With 0.034% Mo. Pennzoil Form 10-K, 1981.
FOUR METALS T23S R16E Sec 20	Dore Mining & Milling	Sulfide	3	0.82	Iso Mines Ltd. Annual Report, 1965.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
GIBSON T1S R14E Sec 21	Lodestar Minerals Inc.	Acid Soluble	11	0.7	43 million tons at 0.04% Cu. Fletcher, J.B. et al report Aug. 1984.
HELVETIA T18S R15E Sec 36	Asarco Inc.	Sulfide Acid Soluble	337 22	0.54 0.55	With Sulfide - 0.088 oz/ton Ag, 0.0005 oz/ton Au.
I-10 T15S R23E Sec 31	Cyprus Minerals Co.	Mixed	100	0.52	Unpublished estimate; with 0.02% Mo.
INSPIRATION AREA MINES T1N R14E Sec 25	Cyprus Minerals Co.	Acid Soluble Sulfide	167 110	0.60 0.52	Inspiration Resources Corp. Annual Report, 1987. Acquired by Cyprus from Inspiration July 1, 1988.
IRON DOOR T13S R25E Sec 17	Unknown	Sulfide	63	0.38	Spike-E Hills Rpt. Cu cff at 0.20% Cu.
KALAMAZOO T9S R16E Sec 9	Magma Copper Co.	Sulfide Sulfide shaft pillar	211 101	0.77 0.68	Form 10-K, 1987.
KAY COPPER MINE T8N R2E Sec 4	Rayrock Mines	Sulfide	3	UNK	Unpublished estimate.
KORN KOB T11S R17E Sec 14	Keystone Minerals Inc.	Acid Soluble	2 8	0.53 0.44	North Ore Body. South Ore Body. Holmes & Narrou report on Korn Kob, March 1974 section 5.
LAKESHORE T10S R4E Sec 25	Cyprus Minerals Co.	Sulfide (Porphyry) Sulfide (Tactite) Acid Soluble	41 9 16	0.71 1.35 0.80	Noranda Annual Report, 1984. Noranda Annual Report, 1984. Cyprus Minerals Form 10-K, 1987.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
LONE STAR T6S R27E Sec 5	Phelps Dodge Corp.	Mixed	1065 1000	0.58 0.41	World Mining, May 1981. Phelps Dodge Form 10-K, 1987.
MAGMA MINE T1S R12E Sec 35	Magma Copper Co.	Sulfide	4	5.70	Magma Form 10-K, 1987.
MAME T19S R25E Sec 20	Hope Mining & Milling Co.	Acid Soluble	1	1.10	Unpublished estimate.
MIAMI EAST T1N R15E Sec 19	Magma Copper Co.	Sulfide Sulfide	6 50	3.14 1.95	Newmont Mining Annual Report, 1985. Minerals Yearbook 1973, VII Area Reports USBM.
MIAMI TAILINGS T1N R15E Sec 30	Magma Copper Co.	Acid Soluble	35	0.33	Magma Form 10-K, 1987. Expect 54% recovery.
MINERAL BUTTE T4S R7E Sec 1	Unknown	Mixed	15	0.42	Cutoff at 0.32% Cu. Bear Creek report.
MINERAL PARK T23N R17W Sec 19	Cyprus Minerals Co.	Sulfide	35	0.17	With 0.054% Mo. Pennzoil Form 10-K, 1981.
MISSION COMPLEX T16S R12E Sec 31	Asarco Inc.	Sulfide	367	0.64	With 0.12 oz/ton Ag. Asarco Annual Report, 1987.
MORENCI/METCALF T4S R29E Sec 16	Phelps Dodge 85% & Sumitomo 15%	Sulfide Sulfide	739 241	0.76 0.69	Additional reserve is Sulfide - 241 million tons at 0.69% Cu. Phelps Dodge Form 10-K, 1987.
NEW CORNELIA T12S R6W Sec 27	Phelps Dodge Corp.	Sulfide	209	0.50	Phelps Dodge Form 10-K, 1987.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ORACLE RIDGE T11S R16E Sec 16	Continental Union Minerals	Mixed	11	2.25	AZ Conference AIME Dec. 1977. With 0.64 oz/ton Ag, Copper Studies Inc, NYC March 30, 1979.
PEACH ELGIN T18S R15E Sec 15	Asarco Inc.	Sulfide Acid Soluble	14 10	0.78 0.75	West, Barbara J. report, January 1980.
PINTO VALLEY T1N R14E Sec 2	Magma Copper Co.	Sulfide	421	0.39	Magma Form 10-K, 1987.
POSTON BUTTE T4S R9E Sec 33	Conoco Inc.	Mixed	800	0.40	Copper Studies Inc, NYC, March 30, 1979. 500 million tons at 0.50% TCu from Conoco Annual Report, 1972.
RAY T3S R13E Sec 10	Asarco Inc.	Sulfide	677	0.70	Asarco Annual Report, 1987.
RED MOUNTAIN T22S R16E Sec 20	Kerr McGee Corp.	Sulfide	100	0.71	Tucson Daily Citizen, Sept. 23, 1970.
SACATON EAST (UG) T5S R5E Sec 26	Asarco Inc.	Sulfide	15	1.25	Asarco Inc. Form 10-K, 1979.
SAN JUAN T5S R26E Sec 35	Cochise Mining Corp.	Acid Soluble	16	0.52	Cutoff at 0.35% Cu or 20 million tons at lower grade with lower cutoff. Producers Minerals Corp rpt June 1975.
SAN MANUEL T8S R16E Sec 34	Magma Copper Co.	Sulfide Sulfide shaft pillar	59 103	0.62 0.64	Magma Form 10-K, 1987. Cutoff at 0.50% Cu.
SAN MANUEL OPEN PIT T8S R16E Sec 35	Magma Copper Co.	Acid Soluble Acid Soluble Acid Soluble	44 11 272	0.43 0.14 0.36	Open Pit. Magma Form 10-K, 1987. Open Pit Marginal. Magma Form 10-K, 1987. In Situ. Magma Form 10-K, 1987.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
SANCHEZ T6S R27E Sec 25	Harpoon, Inc.	Sulfide	120	0.50	With 0.008 oz/ton Aug, 0.1 oz/ton Ag, unpublished estimate.
		Acid Soluble	80	0.30	
		Sulfide	123	0.40	Cutoff at 0.2% Cu, rpt on Carpenter Mine.
		Acid Soluble	12	0.77	Cutoff at 0.5% Cu, rpt on Carpenter Mine.
SANTA CRUZ T6S R4E Sec 13	Freeport McMoran	Acid Soluble	800	0.43	50% joint venture with ASARCO. USBM data 1985.
SHEEP MOUNTAIN PROPERTY T8N R2W Sec 13	Smith, Ken P. et al	Sulfide	300	1.00	To 400 tons, copper content approx. Unpublished estimate.
SIERRITA T18S R12E Sec 7	Cyprus Minerals Co.	Sulfide	326	0.30	With .037% Mo. Cyprus Minerals Co. Form 10-K, 1987.
SILVER BELL T12S R8E Sec 11	Asarco Inc.	Sulfide	21	0.68	With .07 oz/ton Ag. Asarco Annual Report, 1987.
SQUAW PEAK T13N R5E Secs 29 & 30	Squaw Peak Copper	Sulfide	20	0.36	Roe, Robert R., 1976 report.
STRONG & HARRIS T15S R22E Sec 13	Durham, A. et al	Mixed	60	0.60	Unpublished estimate with 0.70% Zn.
TURQUOISE T19S R25E Sec 17	Santa Fe Mining	Acid Soluble	10	0.50	Pub. 1975 by Union Oil.
TWIN BUTTES T18S R13E Sec 5	Cyprus Sierrita	Sulfide	37	0.92	Cyprus Minerals Co. Form 10-K, 1987.
		Acid Soluble	11	0.73	(same as above)
VAN DYKE T1N R15E Sec 30	Kocide Chemical	Acid Soluble	100	0.50	Mining Engineering, Dec. 1977.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA *(1*

DEPOSIT & LEGAL DESCRIPTION	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
VEKOL HILLS T10S R3E Sec 4	Papago Tribe, Tohono O'odham	Sulfide	105	0.56	With 0.014% Mo, 16 million tons acid soluble Cu. Final EIS, Vekol Hills Project, US Dept of Interior, Bureau of Indian Affairs, May 1988.
VENTURA T23S R15E Sec 1	Cyprus Minerals Co.	Sulfide	6	0.26	Iso Mines Ltd Annual Report, 1965. With 0.28% MoS (6 million additional tons possible)
WHITE MESA T38N R9E Sec 29	Navajo Tribe	Acid Soluble	2	0.75	Mayo, E.B., 1955 report.
ZONIA T11N R4W Sec 12	Antioch Resources & Queenstake Resources	Acid Soluble	35	0.31	Lundin, R. J. et al, Feb. 1985 report.

TOTAL COPPER RESERVE BASE IN ARIZONA

Sulfide	5.6	Billion tons at	0.65% Cu
Acid Soluble	1.9	" " "	0.44% Cu
Mixed	3.6	" " "	0.54% Cu
TOTAL	11.1	" " "	0.58% or 64 million tons of copper

(1 ***Reserve Base*** *-That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).*
"Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3.

COPPER RESERVES

1 Antler
2 Atlas
3 Bagdad
4 Buckeye East
5 Cactus
6 Carlota
7 Casa Grande
8 Chilito
9 Christmas
10 Cochise
11 Copper Basin
12 Copper Butte
13 Copper Creek
14 Copper Queen
15 Dos Pobres
16 Dragoon
17 Dynamite
18 Emerald Isle
19 Esperanza
20 Four Metals
21 Gibson
22 Helvetia
23 I-10
24 Inspiration Area Mines
25 Iron Door
26 Kalamazoo
27 Kay Copper Mine
28 Korn Kob
29 Lakeshore
30 Lone Star
31 Magma Mine
32 Mame
33 Miami East
34 Miami Tailings
35 Mineral Butte
36 Mineral Park
37 Mission Complex
38 Morenci/Metcalf
39 New Cornelia
40 Oracle Ridge
41 Peach Elgin
42 Pinto Valley
43 Poston Butte
44 Ray
45 Red Mountain
46 Sacaton East (UG)
47 San Juan
48 San Manuel
49 San Manuel Open Pit
50 Sanchez
51 Santa Cruz
52 Sheep Mountain Property
53 Sierrita
54 Silver Bell
55 Squaw Peak
56 Strong & Harris
57 Turquoise
58 Twin Buttes
59 Van Dyke
60 Vekol Hills
61 Ventura
62 White Mesa
63 Zonia

COPPER RESERVES - LISTED BY COMPANY

Company	Deposit
American Pacific Mining Co. Inc.	Atlas
Antioch Res. & Queenstake Res.	Zonia
Asarco Inc.	Sacaton East (UG)
Asarco Inc.	Silver Bell
Asarco Inc.	Copper Butte
Asarco Inc.	Ray
Asarco Inc.	Helvetia
Asarco Inc.	Peach Elgin
Asarco Inc.	Buckeye East
Asarco Inc.	Chilito
Asarco Inc.	Mission Complex
Casa Grande Copper Co.	Casa Grande
CF & I Steel Corp.	Dragoon
Cochise Mining Corp.	San Juan
Conoco Inc.	Poston Butte
Continental Union	Oracle Ridge
Cyprus Minerals Co.	I-10
Cyprus Minerals Co.	Lakeshore
Cyprus Minerals Co.	Esperanza
Cyprus Minerals Co.	Mineral Park
Cyprus Minerals Co.	Sierrita
Cyprus Minerals Co.	Bagdad
Cyprus Minerals Co.	Ventura
Cyprus Minerals Co.	Inspiration Area
Cyprus Sierrita	Twin Buttes
Dore Mining & Milling	Four Metals
Durham, A. et al	Strong & Harris
Freeport McMoran	Santa Cruz
Harpoon, Inc.	Sanchez
Hope Mining & Milling Co.	Mame
Inspiration Consolidated Copper Co.	Christmas (OP)
Kerr McGee Corp.	Red Mountain
Keystone Minerals	Korn Kob
Kocide Chemical	Van Dyke
Lodestar Minerals Inc.	Gibson
Magma Copper Co.	Miami Tailings
Magma Copper Co.	San Manuel
Magma Copper Co.	Kalamazoo
Magma Copper Co.	Pinto Valley
Magma Copper Co.	Magma Mine
Magma Copper Co.	Miami East
Magma Copper Co.	San Manuel Open Pit
Magma Copper Co.	Copper Creek
Magma Copper Co.	Cactus
Navajo Tribe	White Mesa
Owens, S.B.	Carlota
Papago Tribe, Tohono O'odham	Vekol Hills
Phelps Dodge Corp.	Dos Pobres
Phelps Dodge Corp.	Copper Basin
Phelps Dodge Corp.	Lone Star
Phelps Dodge Corp.	Copper Queen
Phelps Dodge Corp.	New Cornelia
Phelps Dodge Corp.	Morenci/Metcalf
Phelps Dodge Corp.	Cochise
Rayrock Mines	Kay Copper Mine
Santa Fe Mining	Turquoise
Smith, Ken P. et al	Sheep Mountain
Smith, V.A. - Estate	Dynamite
Squaw Peak Copper	Squaw Peak
Standard Metals	Antler
TSC Enterprises, Inc.	Emerald Isle
Unknown	Iron Door
Unknown	Mineral Butte

TABLE XXIV

ARIZONA AND U.S. COPPER MINE PRODUCTION IN SHORT TONS OF Cu, 1874-1987

Period	AZ Production (1	Cumulative AZ	U.S. Production (1	Cumulative U.S.	AZ % of U.S. Prod. Ann'l	AZ % of U.S. Prod. Cum
1874-1971*		24,889,171		60,365,183		41.2
1972	847,929	25,737,100	1,664,840	62,030,023	50.9	41.5
1973	867,506	26,604,606	1,717,940	63,747,963	50.5	41.7
1974	804,904	27,409,510	1,597,002	65,344,965	50.4	41.9
1975	751,489	28,160,999	1,413,366	66,758,331	53.2	42.2
1976	956,215	29,117,214	1,605,586	68,363,917	60.0	42.6
1977	852,620	29,969,834	1,503,964	69,867,887	56.7	42.9
1978	908,835	30,878,669	1,496,482	71,364,363	60.7	43.3
1979	957,251	31,835,920	1,591,200	72,955,563	60.2	43.6
1980	760,926	32,596,846	1,301,900	74,257,463	58.4	43.9
1981	1,071,949	33,668,795	1,695,500	75,952,963	63.2	44.3
1982	848,750	34,517,545	1,264,322	77,217,285	67.1	44.7
1983	747,604	35,265,149	1,144,306	78,361,591	65.3	45.0
1984	822,815	36,087,964	1,215,400	79,576,991	67.7	45.3
1985	878,044	36,966,008	1,218,900	80,795,891	72.0	45.8
1986	878,926	37,844,934	1,180,564	81,976,455	74.4	46.2
1987 (Prelim)	862,034	38,706,968	1,405,091	83,157,019	61.4	46.5

* For Cumulative Breakdown 1874-1911 and Annual Production 1912-1971, see "The Copper Industry" by Ken Phillips, published February 1973 by ADMMR.

(1 Source: "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines and Table I this report.

THE ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

The Department's task is to promote the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence data base and disseminating information through publications, personal contacts and seminars.

The Department's mining engineers and geologists assist mining and exploration companies, prospectors and others interested in Arizona's minerals with mineral processing, mineral land acquisition, exploration, mine development, financing, government regulations and marketing.

The Department is a service agency and does not regulate, tax or require any type of registration. The agency provides many different services tailored to meet the differing needs of the public. The following list of services are those which the explorationist may find of benefit.

- Maintain a site specific data base of unpublished reports and maps which includes 5,000 mine files and indexes of 10,000 computerized Arizona mineral locations.

- Maintain an information bank and library of mineral and mining information including, a mine map library (hard copy and microfilm), government publications, periodicals, and unpublished master and doctorate theses.

- Gather and disseminate information on commodities and markets.

- Suggest target areas for possible exploration activity.

- Suggest prospects and individual properties for study and acquisition.

- Assist individuals and companies in their dealings with State regulatory agencies to facilitate their mining and exploration activity.

- Provide publications in the form of mineral reports, annual directories, technical reports, annual mineral industry surveys and information circulars. These include *Laws and Regulations Governing Mineral Rights in Arizona*, *Directory of Exploration Offices in Arizona*, *Manual for Determination of Status and Ownership of Arizona Mineral and Water Rights*, and others. A current listing of the Department publications is available upon request.